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APPLETON'S
NEW PRACTICAL
CYCLOPEDIA

APPLETON'S NEW PRACTICAL CYCLOPEDIA

A NEW WORK OF REFERENCE
BASED UPON THE BEST AUTHORITIES, AND SYSTEMATICALLY ARRANGED FOR USE IN HOME AND SCHOOL

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VOLUME VI

NEW YORK
D. APPLETON AND COMPANY
1910

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209019

KEY TO PRONUNCIATION

ā, as in *fate*.
ă, as in *fat*.
â, as in *fall*.
ä, as in *father*.
ã, as in *welfare*.

ē, as in *meet*.
ĕ, as in *met*.
ė, as in *her* and *eu* in French *-eur*.

ī, as in *five*.
ĭ, as in *it*.

ō, as in *sober*.
ŏ, as in *not*.
ô, as in *fool* or *spoon*, or as *u* in *rule*.
õ, as in *foot*.
ö, as in *Göthe* and *eu* in French *neuf*.

ū, as in *mule*.
ŭ, as in *but*.
ü, produced with lips rounded to utter *oo* and tongue placed as in uttering *e*.
û, as in *burn* or *burg*.

ch, as in German *ich*.

kh, as *ch* in German *nacht* and Scotch *loch*, and as *g* in German *tag*.

th, as in *thin*.

th, as in *though*.

ṅ, French nasal *n* and *m*; pronounce *ang*, *ong*, *ung*, etc., in usual way, but without sounding the *g*.

ñ, Spanish n-y, as in cañon; French and Italian —gn, as in Boulogne.

APPLETON'S

NEW PRACTICAL CYCLOPEDIA

VOLUME VI

Sis'ters of Char'ity. See CHARITY, SISTERS OF.

Sisters of Mer'cy, Roman Catholic sisterhood, founded at Dublin, 1827, by Miss Catherine McAuley. The rule is similar to that of the Presentation nuns. Originally each convent was independent, but offshoots from the parent house, especially outside of Ireland, are usually subject to it. These religious women are under the jurisdiction of the local bishop. They were introduced into the U. S. in 1843, at Pittsburg. They have more than 200 convents, and are occupied in the conduct of parochial schools, academies, hospitals, and homes for the aged.

Sis'yphus, in Grecian mythology, son of Æolus, father of Glaucus, grandfather of Bellerophon, and king and founder of Corinth. Because of his deceitful wickedness Zeus sent Death to take him to Hades; but Sisyphus bound Death and held him prisoner, so that no one died until Death was released by Ares. For this reason (though other reasons also are given) Sisyphus was doomed to roll to the top of a mountain rock, which always broke away from him just as the top was being reached.

Sit'ka (formerly NEW ARCHANGEL), former capital of Alaska Territory, on Baranof Island, near the Pacific. It has a harbor that is deep and commodious, but is difficult of approach. It was founded by the Russians in the eighteenth century, but consisted, when transferred to the U. S., 1867, of only 100 log huts. Since then several large edifices have been built. Pop. (1906) 1,396. In 1906 Juneau became the capital of Alaska.

Sit'ting Bull (Indian name, TATANKA YOTANKA), 1837-90; Sioux chief and medicine man; became the leader of the unruly members of his tribe, who massacred whites at Spirit Lake, Iowa, and in Minnesota 1862, and were driven by Gen. Sully into the Big Horn region and to the Yellowstone, 1864. They were defeated on the Muscle Shell River, 1868; were placed on a reservation in the Black Hills, from which they were driven by miners, 1876; refused to be transported to the Indian Territory; slew a party of troops under Gen. Custer. On being pursued by Gen. Terry, Sitting Bull and some of his followers escaped into Canada. He surrendered on a promise of pardon 1880, and returned to Dakota, but fomented trouble, and in the Indian rising in 1890 he was killed.

Si'va, or Shiva, a Hindu god, the "Destroyer and Regenerator," member of the Hindu Trimurti or triad of divinities, with Brahma, the "creator," and Vishnu, the "preserver." He appears under many names, attributes, and functions. As the Destroyer he is represented by Rudra. As the Regenerator or Reproducer his symbol is the linga or phallus, and under this he is worshiped. He represents the contemplative and ascetic side of Hinduism. He is represented as sitting absorbed in thought, naked, and smeared with funereal ashes, with matted hair, and a necklace of human skulls and bones. He has three eyes, and fire from them consumes those who interrupt his devotions.

Sivathe'rium, extinct genus of ruminants from the Siwalik Hills, India, remarkable for their size and peculiar horns. *Sivatherium giganteum* nearly equaled the elephant in size, and was armed with two pairs of horns, a small pair on the anterior part of the head and a larger pair on the top.

Six-prin'ciple Bap'tists, a sect of American Christians who take as their creed the principles laid down in Hebrews vi, 1, 2: (1) repentance, (2) faith, (3) baptisms (of repentance, of fire, and of Christ's sufferings), (4) laying on of hands, (5) the resurrection, (6) the eternal judgment. There are in the U. S. (1908) abt. 850 communicants and 12 churches.

Six'tus, the name of five popes; the most important follow: SIXTUS IV (Francesco della Rovere), 1414-84; entered the Franciscan order; attracted notice by his eloquence and learning; became the close friend of Cardinal Bessarion, through whose influence, it is said, he was chosen pope 1471. He built the Sistine bridge and the Sistine chapel. He was munificent in his patronage of arts and letters. He used his influence to advance relatives, and was unfortunate in some of his political affiliations. SIXTUS V (Felice Peretti), 1521-90; one of the ablest of the popes; entered the order of the Franciscans; taught canon law at Rimini and at Siena, and became a cardinal in 1570. His ambition seemed to go no further. He lived quietly, and gave the impression of being a man easy to lead. The cardinals, thinking he would be mild and indulgent, elected him, but he threw off all concealment of the natural energy of character, and began vigorous reforms. His aim was to raise the papal see to its former splendor, and his political negotiations show his capacity for statesmanship. The aqueduct Aqua Felice, the great dome of St. Peter's, the obelisk in front of this church, and the library buildings of the Vatican are among the works that he executed. He suppressed the banditti, encouraged trade, and enforced the law in his states.

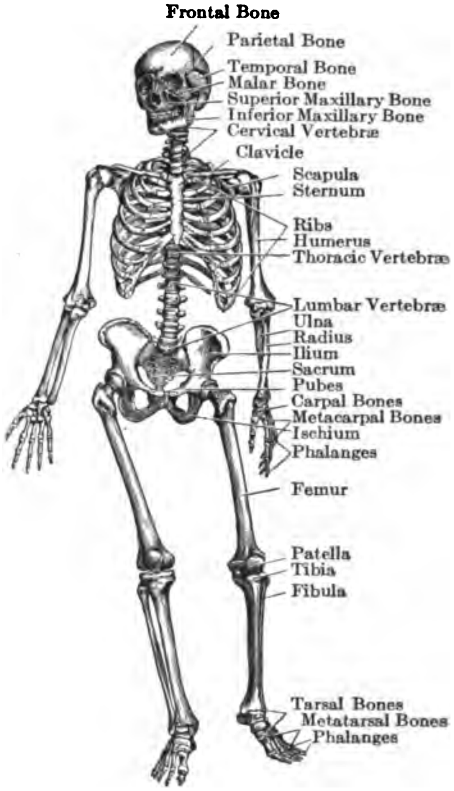
Skagerrak' (formerly Skager-Rack), an arm of the North Sea, 80 m. broad, between Norway and Jutland, connecting the German Ocean with the Cattegat or Kattegat.

Skate, a name popularly applied to several species of the genus of fishes *Raiidæ*, or rays. The skeleton is cartilaginous, the body much depressed and more or less approaching to a rhomboidal form. The common skate agrees with other members of the genus in possessing a flat, broad body, the chief portion of which is made up of the expanded pectoral fins, which are concealed, in a manner, under the skin. The tail is long and slender; the snout pointed, with a prominent ridge or keel. The teeth are arranged in a mosaic or pavementlike pattern. The fish, although commonly seen of moderate dimensions, may attain a weight of 200 lb. or more.

Skee, or **Ski,** a Scandinavian snowshoe made from a long wooden runner, 6 to 10 ft. in length, about the width of a man's foot, and ¼ in. thick, with a groove along the middle of the under surface to prevent slipping sideways. It is curved upward at the tip. In the U. S., Canada, and Norway clubs have been formed for the sport of skeeing, the contests being for long runs, 20 m. or more, for short runs at high speed, and for jumping. The latter is a long flight through the air from a hillside, and the jumper must alight on his feet without falling, and continue his course.

Skel'eton, the structures serving to support and protect the more delicate tissues of an animal. Among the invertebrates the skeleton is often represented by calcareous or siliceous plates developed in connection with the integument, known as the exoskeleton, as distinguished from the apparatus developed within the connective tissue as the cartilage or the true osseous substance of the endoskeleton. A true skeleton exists only in vertebrated animals. Among the higher vertebrates a primary cartilaginous framework is gradually replaced by the osseous skeleton.

The vertebrate axis is formed of a series of disks, from 15 to 365 in number, at one end of which is the cranium, or brain case, which may be considered as composed of enlarged and modified vertebræ. The axial skeleton in man includes the vertebræ, skull, ribs, and sternum, while the appendicular skeleton consists of the shoulder girdle (clavicle and scapula connecting the arm to the axis) and the pelvic girdle (hip bones, or innominata), which supports the thigh bones. In animals, as the whales, where the hind limbs are wanting, the pelvic girdle, and hence the pelvis, is absent. Bones are united by fibro-elastic bands (ligaments) and the structures of the joints. The voluntary muscles are attached to the skeleton and the leverage afforded by the long bones of the limbs gives power and swiftness to their motion. The number of bones in the human skeleton varies with age. Thus the thigh bone or femur represents the fusion of five segments, the union not being complete until the twentieth year. The adult human skeleton consists of 206 distinct bones, as follows:



The Human Skeleton.

The spine, including 24 vertebræ, sacrum, and coccyx.	26
The ribs, 12 pairs, sternum, and hyoid	26
The skull 22, together with 6 ear-bones	28
The upper extremities, each 32	64
The lower extremities, each 31	62

At birth their number is 278; at twenty-five, 224; and in advanced old age, 194. About 660 segments are needed in the formation of the 206 permanent bones.

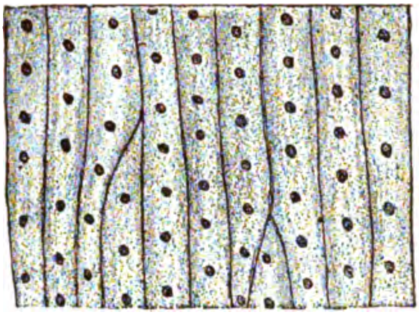
Skel'ton, John, abt. 1455-1529; English poet; b. probably in Norfolk; graduated at Cambridge abt. 1482; laureated at Oxford abt. 1490; tutor to Prince Henry (afterwards Henry VIII); held a position at court, by some considered equivalent to king's jester, by others to poet-laureate; incurred the resentment of Cardinal Wolsey by his satirical verses; obliged to take sanctuary at Westminster, and died there. Skelton was one of the earliest English poets whose writings are easily intelligible to modern readers. Most of his verses are coarse, but were highly esteemed by Erasmus and the wits of the day. His best-known poems are "Philip Sparrow" and "Colin Clout."

Skep'ticism, the doctrine which sets up, as its highest principle, doubt or suspense of judgment in view of the contradictory nature of phenomena, and infers the impossibility of knowing truth. Skepticism, therefore, intensifies mental independence, and is regarded as a necessary clearing up preparatory to philosophic thinking. At least since the time of Descartes this has been the case, and some writers insist that all beginning in philosophy is skeptical, and, on the other hand, that all skepticism is elementary philosophy. Skepticism is based upon the observation of method, and in this respect is a higher activity of the mind than mere dogmatism. Among the Greeks, Georgias had reached the doctrine of nihilism—nothing exists; and Socrates asserted that he knew only that he knew nothing; while Sextus Empiricus sums up ancient skepticism as follows: Nothing is certain in itself, as is proved by the diversity of opinion, and nothing can be made certain by proof, since it derives no certainty from itself, and, if based on other proof, leads us either to the *regressus ad infinitum* or to a vicious circle. See AGNOSTICISM.

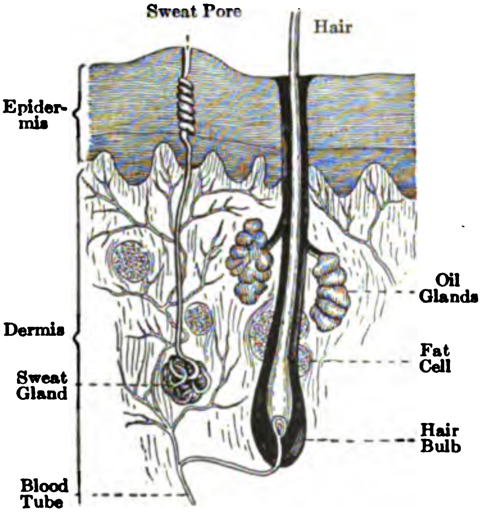
Skim'mer, Scis'sorsbill, or **Shear'water,** any bird of the genus *Rhynchops,* and related to the terns. These birds skim over the sea with the lower mandible, which is much longer than the upper and compressed like a knife blade, cutting through the water. The black skimmer (*R. nigra*) is black above, white below. The spread of wings is 3½ to 4 ft.; length, 16 to 20 in. It ranges northward to New Jersey, but *R. albicollis* is Indian and *R. flavirostris* African.

Skin, the name given to the external layer or tissue of the bodies of most animals, forming at the same time a protective and a blood-purifying organ. Structurally viewed, the skin of all vertebrates consists of two layers—an outer and inner layer. To the outer layer the name of *cuticle, epidermis,* or *scarf skin* is popularly given. This layer is destitute of nerves and of blood vessels, and is thus a nonsensitive structure. The inner layer is a highly vascular and sensitive layer, and is named the *dermis, corium,* or *true skin.* At the lips and elsewhere the epidermis becomes continuous with the more delicate mucous membrane which forms the lining membrane of the internal passages. This membrane is to be viewed as a mere modification of the epidermis itself.

The epidermis is composed of several layers of epithelial cells. The upper cells of the epidermis, as seen in a vertical section of the skin, are flattened, and of scaly conformation, the lower cells being of rounded or elongated shape. The elongated cells have their long axes arranged vertically to the general skin surface. The deeper portion of the epidermis, or *rete mucosum,* is of softer and more opaque consistence and appearance than the upper layer; and it is in the *rete mucosum* that coloring matters are present, which give the hue to the skin. The dermis or true skin rests upon a layer of adipose and cellular tissue, and is composed of interlacing fibers of fibrocellular tissue. It is richly supplied with blood vessels, so that when cut it bleeds; and nerve fibers are likewise disposed in it, conferring sensibility. The surface of the true skin is thrown into a series of elevations—*papillæ,* or minute prominences—which are specially rich in capillary blood vessels and nerve endings, and which are thus particularly vascular and sensitive. The special glands of the skin are in the form of tubes coiled up into balls, and the total number of them in the human skin is estimated at over two millions. There are also sebaceous glands, which secrete an oily fluid useful for lubrication.



SKIN, HIGHLY MAGNIFIED, SHOWING THE OPENINGS OF THE PORES.



SECTION OF SKIN, HIGHLY MAGNIFIED.

Though the most ostensible function of the skin seems to be that it covers and protects the more delicate structures that lie beneath it, its functions as an excretory organ and as a regulator of the temperature of the body are also of high importance. The hair and nails are modifications of the epidermis, as are also the feathers of birds and the claws of animals. Extensions of skin, as between the toes of ducks, etc., or between the arms and legs of flying squirrels, and as seen in bats, may exist. And pendulous skin folds, horns, callosities, horny plates, scales, and other modifications of the epidermis, are met with in various animals. The *scutes*, or bony plates, seen in the armadillos are dermal structures united to horny plates formed by the epidermis. In many reptiles and in some lizards the two layers of the skin similarly participate in forming the exoskeleton. The scales of fishes are formed by the dermis or true skin, but those of serpents are epidermic in their nature. See EPIDERMIS; EPITHELIUM.

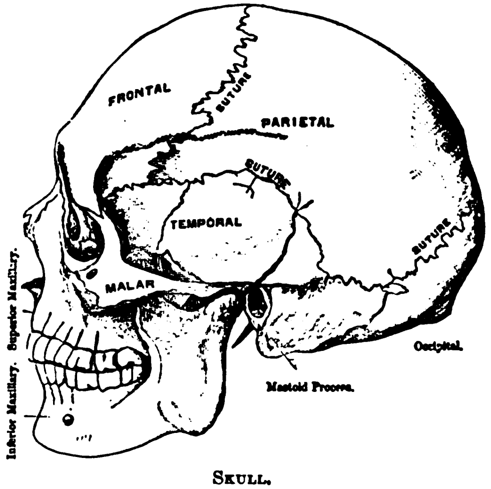
Skink, any one of a numerous species of lizards belonging to the family *Scincidæ*. The body is subcylindrical, with the tail cylindrical or tapering; the scales generally smooth and regular; the limbs variable in development, typically four, generally more or less weak, sometimes atrophied; the tongue is short, flat, and squamous. They are distributed in almost all parts of the world, more especially in the warmer climates. It was believed by the ancients to be a specific for various diseases.

COMMON SKINK.

Sko'beleff, Mikhail Dimitrievich, 1843-1882; Russian general; entered the army as sublieutenant in 1861; distinguished himself against the Poles in 1866, and afterwards in central Asia; appointed military governor of the province of Ferghana, 1876. In the Russo-Turkish War Skobeleff distinguished himself at the second battle of Plevna, and also at Loftscha; was created adjutant general to the emperor, 1878; successfully led an expedition against the Tekke Turkomans, and captured Geok Tepe, January 12, 1881; then promoted to the rank of general. He died suddenly in Moscow. He was a brilliant and scientific officer, and much beloved by the troops.

Sku'a, Skua-gull, or **Jae'ger,** names given to gulls belonging to the subfamily *Stercorariinæ*, who have the habit of pursuing smaller gulls and forcing them to give up their food. They also eat eggs and prey upon small or young birds. The skuas are readily distinguished by the horny hood, or cere, at the base of the bill, beneath which the nostrils open. From four to six species are recognized, the largest being the great Antarctic skua (*Megalestris antarcticus*), the only one peculiar to the S. hemisphere, the others being most abundant in high N. latitudes and in Arctic regions. The large N. species, *M. skua*, is about 2 ft. long, powerfully built, and of a dusky-brown plumage. It is an uncommon bird, and in Great Britain has, through persecution, become so rare that it is now protected by law. Three other and much smaller species occur along the more N. shores of the U. S., and are locally known as gull catchers or gull chasers.

Skull, hard framework of the vertebrate head, composed of the cranium, which protects the brain, and the facial structures. These may consist entirely of cartilage, as in the shark, or of bone, as in mammals. As the size of the skull is intimately connected with brain development, human skulls are grouped according to their cranial capacity, as: microcephalic, below 1,350 c.c. (including such races as the Andamese and Bushmen); mesocephalic, from 1,350 to 1,450 c.c. (as in the American Indians, Chinese, and some negroes); and megacephalic, over 1,450 c.c., met with in the more civilized races (European, Japanese, etc.). The relation of the length to the breadth of the skull is also important, and the "cephalic index" is found by multiplying the maximum length by 100 and dividing the result by the maximum breadth. Dolichocephalic skulls have an index below 75 (as Australians, Zulus, Eskimos); mesoticephalic, from 75 to 80 (as mixed Europeans and Chinese); brachycephalic, over 80 (as Malays, American Indians, etc.). The facial angle is



SKULL.

also calculated in craniology, a skull with a greatly projecting lower jaw, as seen in African negroes, being called prognathous; a lesser degree of projection, as in the Chinese and Polynesians, being mesognathous; while orthognathous includes the almost vertical silhouette of the mixed European races.

In the human skull but twenty-eight bones exist—six in the ears (see EAR), eight in the cranium and fourteen in the face. This is largely due to the fusion of bones distinct in the embryo as well as in the adult of lower forms. The cranial bones are (1) the occipital bone, which lies at the back of the skull; (2) the frontal bone, which forms the forehead; (3) the parietal bones, two in number, which meet one another above the middle of the crown of the head, and form a large part of the sides and roof of the skull; (4) the temporal bones, one on each side, which contain the ear cavities; (5) the sphenoid bone, which, with the occipital bone, forms the base of the skull; (6) the ethmoid bone, which forms the partition between the brain and the nose chambers. The paired bones of the face are (1) the maxillæ, or upper jaw bones; (2) the palate bones; (3) the malar, or cheek bones; (4) the nasal bones; (5) the lachrymal, or tear bones, between the eye socket and the nose; (6) the inferior turbinate bones, in the nose. The single bones of the face are the lower jaw bone, or mandible, and the vomer, which forms a partition between the two nostrils. See MAN; PHRENOLOGY.

Skunk, a musteloid carnivorous mammal of the *Mephitinæ*. The body is moderately elongated and arched backward; the legs comparatively short; the feet subplantigrade; the tail rather long and very bushy; the color is particolored, black and white being contrasted. Their anal glands contain a nauseous liquid, which the animal, on being alarmed, discharges with such force that the jet is carried from 8 to 12 ft.

COMMON SKUNK.

The skunks are distributed throughout America, N. as well as S., except the coldest parts, and are found in no other portion of the world. They are all active carnivorous animals, feeding on small quadrupeds and birds as well as reptiles. They burrow and hibernate. They bring forth from six to nine at a birth. The mephitic fluid has been employed medicinally as an antispasmodic. The bite of the animal is dreaded, and is said to induce hydrophobia. *Mephitis mephitica* is the common large skunk; *M. putorius*, the little striped skunk; *Conepatus mapurito* is about the size of *M. mephitica*, and extends into the SW. of the U. S. (Texas, etc.), from Mexico. Skunks are beneficial from the number of mice and insects they devour. They are said to be gentle, inoffensive pets. Their fur is sold as Alaskan sable.

Skunk Cab'bage, the *Symplocarpus fœtidus*, a large marsh plant of the arum family, common in the U. S., distinguished by the unpleasant smell of its leaves. It produces early in the spring its four-petaled flowers in a globular cluster upon a short stem. The fruit is oval and fleshy, inclosing large purple seeds. The roots and leaves have been used as stimulants.

Skye (skī), island of Scotland, the largest of the Inner Hebrides; area, 535 sq. m. The surface is mountainous and rugged. Fishing is the principal occupation. The inhabitants are poor, and their number decreases, as many emigrate. Pop. (1901) 14,642.

Sky'lark, the *Alauda arvensis*, an Old World bird, noted for its song. It is about 7 in. long, the tail being 3. It is found all over Europe, as well as in N. Africa and the corresponding zones of Asia. It frequents meadows, and does not perch. It feeds chiefly on seeds and larvæ. Its nest is on the ground. It lays four or five eggs of a whitish gray. It is esteemed for the delicacy of its flesh and the melody of its song.

Slan'der. See LIBEL AND SLANDER.

Slate, a rock consisting largely of silicate of aluminum, which splits into slabs or plates, formed by the consolidation, under heat and pressure, of clay deposited in still water. It weighs from 170 to 180 lb. per cubic foot, and its most extensive use is for roofs. The output of slate in the U. S. in 1892 was valued at $4,117,125, of which $2,333,000 worth was quarried in Pennsylvania and $1,014,000 worth in Vermont.

Slav'ery, a state of bondage of one human being to another. In its usual sense it does not include the milder forms of bondage, such as serfdom or villanage. In its origin it was the sign of civilization, in that it arose from the sparing of captives, who in savagery were slain by their captors. The slavery of the industrial classes has characterized the early history of all civilized races, and as forcing men to labor, despite the reluctance inherent in barbarous tribes, seems to have been a necessary element of progress. It existed among all races of whom there is historic record, but in some its rigors were mitigated by peculiar laws and customs, as among the Hebrews, whose slaves became free after seven years, while every fiftieth year all slaves were emancipated.

The rearing of slaves was not profitable in Greece; it was cheaper to purchase those who had reached the age of labor. They were employed in domestic service, in agriculture, and even in commerce, and occupations in which the risk and responsibility were great. In Attica the slaves bore to the free native population the ratio of three to one, and in Sparta the Helots numbered 220,000, while the Spartans numbered only 32,000. In Sparta the Helots suffered cruel treatment, while Athenian masters were noted for their mildness. In Athens a slave who had a just complaint against his master could demand to be sold; he had a right to asylum in the temples, and his death could be avenged. He could purchase his freedom, and could be liberated by the act of his master. Emancipation was frequent. No consciousness of the injurious moral effects of slavery seems to have been felt by the greatest thinkers.

In Rome the sources of supply of slaves were wars and commerce. The proportion of slave to free is estimated at three to one in the period 150 B.C.–235 A.D. A freedman in the reign of Augustus is said to have left over 4,000, and families of 200 or 300 slaves were not uncommon. A slave was under the dominion of his master, against whom he had no legal redress. The marriage of slaves had no legal recognition, nor could a slave acquire property, though it became customary to permit him to enjoy a share of his earnings, known as his *peculium*. Punishments for crime were severe against slaves. Their harsh treatment is attested by several servile insurrections, as that of Eunus in Sicily, 133 B.C., and that of Spartacus in 73 B.C. By the second century greater humanity began to display itself in dealing with the slaves. Upon contact with the Roman civilization the Germanic tribes were naturally affected by the system of agricultural labor which they found in operation, the *coloni* being free but not allowed to leave the soil. The resulting system was serfdom (see SERF).

During the Middle Ages slavery was still practiced, but among Christian races the enslavement of Christians was opposed by the Church. No such scruple applied to the enslavement of Mohammedans, many of whom were held as slaves in Europe, while Christian slaves were left in the hands of the Turks and Saracens. The great commercial cities of Italy carried on an extensive slave trade with the East, and the corsairs of Barbary carried off Christians into slavery, even penetrating into Spain and S. France, and seizing the peasants. Charles V freed 20,000 Christian slaves after his expedition against Tunis in 1535, and 12,000 Christian galley slaves were liberated after the battle of Lepanto, 1571. White slavery still exists among the Mohammedans, but the slaves are on the whole humanely treated. The traffic in black slaves, however, is marked by atrocity, and continues despite the prohibition of the Porte.

African slavery on an extensive scale was not practiced by Europeans till after the discovery of America, when a great demand arose for negro labor. The Portuguese had at first a monopoly of the slave trade, but the English soon took part in supplying the Spanish demand. The first slaves sold to English colonists were brought by a Dutch vessel to Jamestown in 1619, but the English afterwards supplied the greater number, and continued the trade throughout the eighteenth century, despite the increasing opposition to it on both sides of the Atlantic. The Quakers had from the first opposed it, but they lacked numbers and influence. The enemies of slavery, through the labors of Clarkson, Sharp, Wilberforce, and others, after repeated failures to secure legislation triumphed at last, and an act abolishing the slave trade was passed, 1807. August 28, 1833, a law was enacted fixing August 1, 1834, as the date for the emancipation of all slaves within the British Empire, and providing for the payment of £20,000,000 to the masters, who, however, were to retain their slaves as apprentices till August, 1840. The apprenticeship system was found to work badly, and was discontinued in 1838. Slavery was not abolished in Brazil till 1888.

In the U. S. the slave trade was forbidden by law in 1808. Franklin, Jefferson, Madison, and Jay were among the advocates of emancipation, and in the N. this policy was so far carried out that by 1821 slavery had ceased to be a power in that region. The ordinance of 1787 prohibited slavery in the Northwest Territory. In the S., however, the cotton gin caused an ever-increasing demand for slave labor, and the S. states were more tenacious of slavery while the abolition sentiment was developing in the N. The more moderate opposition confined itself to attempts to restrict its sphere, but unconditional abolition was favored by radical reformers like Benjamin Lundy and W. L. Garrison, who represented a small and discredited but aggressive party. The contest belongs to the history of the U. S. In the Missouri Compromise, in the struggle over the Wilmot Proviso, resulting in the formation of the Freesoil Party, in the Kansas-Nebraska difficulty, and the formation of the Republican Party the extension of slavery became the leading issue. When civil war followed secession, the expediency of emancipation as a war measure began to be seriously considered, and on January 1, 1863, Lincoln issued a proclamation granting unconditional emancipation to nearly four million slaves. See NEGROES; SERFS.

Slav'ic Lan'guages, group which embraces Russian, Polish, Servian, etc. The undivided Slavic people, apparently with the principal designation of *Slovêne* (sing. *Slovêninŭ*), inhabited the region of the Vistula (upper and lower) and of the upper Dniester and Dnieper, extending to the outer fringe of the Carpathian Mountains. They are first mentioned by Pliny, Tacitus, and Ptolemy as the *Venedæ* (Οὐενέδαι). The Slavic overflow into central and SE. Europe came to a close in the first decade of the sixth century. The patriarchal organization of the Slavs and their division into small disunited tribes allowed them to make no immediate political impression on their better organized neighbors. Their Christian neighbors sought both to convert and to subjugate them. In the meantime the Slavs learned the new forms of political and national life from those around them.

In answer to a request of Rostislav, who wished to free his kingdom from ecclesiastical dependence upon the Frankish, the learned Constantine and his brother Methodius were sent from Constantinople as missionaries to the Slavs. Constantine (later called Monk Cyril) found a literary language for all the Slavs—the Church Slavonic or Old Bulgarian (Old Slovenian), which served for many centuries as the organ of the Church and of civilization for half the Slavic race. It was written in two alphabets—the Glagolitic, still retained for Constantine's writings, and the Cyrillic, which arose soon after, apparently in Bulgaria, and, because of its simplicity and resemblance to the liturgical Greek uncial (while the Glagolitic is based chiefly on the cursive minuscule), displaced the earlier alphabet. With some modernization under Peter the Great, it is still the alphabet of Great and Little Russian, Bulgarian, and Servian, while the Croatian, Slovenian, Slovakian (Horvatian), Czech, Lusatian-Servian, and Polish use the Latin alphabet. In Slavic philology Church Slavonic plays much the same part as Gothic in Germanic philology. It has the advantage of having received a fixed literary form three hundred years earlier than any other dialect, and uses an alphabet extraordinary for its fine phonetic discriminations.

Slavo'nia, territory of Austria-Hungary, bounded N. by the Drave, S. by the Save, and E. by the Danube; area, 9,106 sq. m. See CROATIA.

Slavs, a race of Indo-European relationship, characterized chiefly by their speech and constituting three tenths of the population of Europe, and divided into three main branches—Eastern, Western, and Southern. To the first belong the Russians and Ruthenians; to the second the Poles, the Czechs, the Slovaks, and the Wends; to the third the Bulgarians, the Servians and Croatians, and the Slovenes.

Sleep, a normal and periodical condition of the organism in which there is more or less unconsciousness with loss of power of voluntary motion. The lowest forms of animals, as the amœba, do not show any rest resembling sleep. Among the theories of the cause of sleep are that it is due to (1) a periodical anemia of the brain; (2) a numbing of the brain by exhaustion products accumulated during the day; (3) a shrinking of the nerve elements in the brain so that temporarily they do not interlace. During sleep the circulation is slower. The heart beats with more regularity, but with less force and frequency. So the blood is not distributed so thoroughly and rapidly as during wakefulness, and the extremities readily lose their heat.

The nervous system continues in action during sleep, though generally with somewhat diminished power and sensibility. The reflex functions of the nerve centers are still maintained, and thus various movements may be executed without consciousness being awakened. Somnambulism is a condition of exaltation in the functions of nerve centers without the controlling influence of the cerebrum being brought into action; but aside from this rather abnormal phenomenon, there are others which are entirely within the range of health. Thus, if the position of the sleeper becomes irksome, it is changed; if the feet become cold, they are drawn up to a warmer part of the bed; and cases are recorded in which individuals have risen from bed and performed many complicated and apparently volitional acts without awaking. The extreme of this condition is known as somnambulism, or sleep-walking.

That the imagination may in its flights during sleep strike upon fancies which are subsequently developed by the reason into lucid and valuable ideas is probable. It would be strange if, from among the absurdities and extravagances to which it attains, something fit to be appropriated by the mind should not occasionally be evolved, and there are many instances of the starting point of important mental operations having been taken during sleep. The clarifying effect of "sleeping over" a complicated mental problem is well known, thoughts being found to be rearranged and coördinated when waking life is resumed. Yet there are many instances on record of knowledge which had passed out of the mind being reacquired during sleep. During sleep judgment is suspended. We do not actually lose the power of arriving at a decision, but we cannot exert the faculty in accordance with truth and reasoning. An opinion may be formed during sleep, but it is more likely to be wrong than right; and no effort that we can make will enable us to distinguish the false from the true, or to discriminate between the possible and the impossible.

Deprivation of sleep—a form of punishment in China—produces death in a few days. Continued insomnia demands medical treatment, as it too often leads to mental deterioration, insanity, and suicide. Hypnotics should be taken only upon prescription, and after outdoor exercise, bathing, and proper hygiene have proved ineffectual. An infant may sleep twenty hours out of every twenty-four; a child may sleep twelve hours; as age advances sleep becomes less profound. The deepest sleep occurs in the first two hours after retiring.

Sleep'ing Sick'ness (*Trypanosomiasis*), also called AFRICAN LETHARGY, a disease prevalent in Africa, particularly in the Uganda and the Kongo district. Although white men are by no means immune, it occurs mainly among the negroes. It is believed to be due to an animal parasite, transmitted to its victims by means of the tsetse fly, and causes, specially, cerebral disorder and nervous disorganization. The symptoms are headache, pains in the chest, dullness of faculties, loss of mental and physical energy, apathy, lassitude, and increasing desire for sleep. Some cases reach their fatal termination in two or three months, others not for years. Coma appears in the final stage, and death usually follows from starvation.

Sleep of Plants, the nocturnal condition of many plants. Many leaves assume a particular position at nightfall or in a darkened room, as is the case with certain sorrels (*Oxalis*), clovers (*Trifolium*), sensitive plants (*Mimo-*

sa), and other *Leguminosæ*. Many flowers close at night and open in the morning, as of species of *Portulaca* and *Oxalis*, the dandelion, and other *Compositæ*.

Slick, Sam. See HALIBURTON, THOMAS CHANDLER.

Slidell', John, 1793–1871; American statesman; b. New York; settled at New Orleans; U. S. District Attorney, 1829–33; member of Congress, 1843–45; minister to Mexico, 1845, but not received by the Mexican Govt.; U. S. Senator, 1853–61, but withdrew upon the secession of his state, which he had done much to promote. Sailing from Charleston as commissioner of the Confederate Govt. to France, he and his associate, James M. Mason, embarked at Havana on the British steamer *Trent*. On November 8, 1861, Capt. Wilkes, of the U. S. frigate *San Jacinto*, stopped the *Trent*, seized the commissioners, and brought them to the U. S., where they were imprisoned at Fort Warren. Bitter denunciations of the seizure appeared in the British press, and the attitude of the British Govt. was threatening, but the U. S. disavowed the act of Wilkes and released the prisoners January 1, 1862.

Slide Rule, an instrument for solving arithmetical problems where approximate results are satisfactory. The form invented by William Oughtred (1573–1660) is best known, and the more precise one introduced by Edwin Thacher in 1885 is much used. The principle is that of logarithms, the divisions on one scale being those of the logarithms of numbers from 1 to 100, or from 1 to 1,000, while the numbers themselves are marked at the divisions of the other; by sliding one scale along the other the products and quotients of two numbers may be read off by inspection.

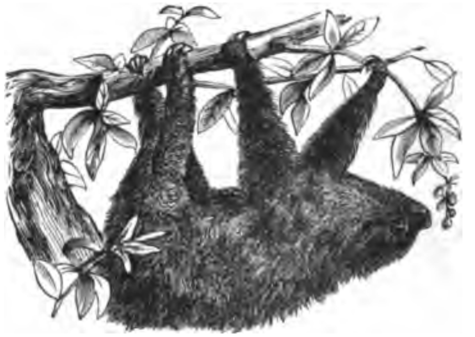
Sli'go, country of Connaught, Ireland; area, 721 sq. m. Agriculture is the principal occupation, especially cattle breeding and dairy farming. Pop. (1901) 84,083. Principal town, Sligo, 137 m. NW. of Dublin; pop. (1901) 10,862.

Sling, a small disk of leather pierced by a hole and suspended by one, two, or three strings, say a yard long. A stone was placed upon the disk, and then whirled rapidly about, when one of the strings was dropped from the hand at the proper instant and the missile sent with force through the air. A sling was used by David in his encounter with Goliath. The Greeks used the sling, often with a plummet of lead. The Persians, Archæans, Acarnanians, and especially the Balearic islanders, were famous slingers.

Slo'cum, Henry Warner, 1827–94; American military officer; b. Pompey, N. Y.; graduated, West Point, 1852; appointed second lieutenant of artillery; first lieutenant, 1855. After a brief campaign against the Seminoles, he resigned to practice law. On May 21, 1861, he was colonel of the Twenty-seventh New York Volunteers, and led at Bull Run, July 21st. He was engaged in the siege of Yorktown and action of West Point. At Gaines's Mill, June 27th, his command rendered important service; at Glendale, June 30th, it held the right of the main line, as at Malvern Hill, July 1st. He was made a major general of volunteers July 4th, and engaged in the second battle of Bull Run, at South Mountain, and at Antietam. In command of the Twelfth Corps, he led at Chancellorsville and at Gettysburg, where he commanded the right wing. He then served in the Department of the Cumberland and the District of Vicksburg. In command of the Twentieth Corps, he was the first to occupy Atlanta, Ga., September 2d. In Sherman's march to the sea he commanded the left grand division. In September, 1865, he resigned, and resumed the practice of law; was member of Congress, 1870–72 and 1884–86.

Sloe, fruit of the blackthorn (*Prunus spinosa*), a small thorny plum tree of Europe, sparingly naturalized in the E. U. S. The black austere fruit is used for preserves, for making a factitious port wine, and for dyeing black. The unripe fruit yields German acacia, a substitute for gum arabic, and the wood is made into walking sticks. The sloe is perhaps the original form of the plum.

Sloth, any one of several species of the *Bradypodidæ*, notable for sluggishness. The form resembles that of the *Primates* (man and monkeys) in the freedom of the members from the common abdominal integument, the length of the limbs, and especially of the fore ones, and the atrophy of the tail. Toes in reduced numbers, two or three (fully developed) in front and three behind. The species differ considerably. All are confined to S. and Central America. Numerous peculiar characters are exhibited by the skeleton. The species are ill adapted for progression on the ground, the feet being bent inward, but are fitted for life in trees. Unlike all other mammals, they cling to the branches by their feet with the back downward, and thus they progress, feed, and sleep. They rarely or never voluntarily descend to the ground, but when one tree is denuded of its leaves proceed from it to a contiguous one by means of interlocking boughs.



UNAU OR TWO-TOED SLOTH.

Sloyd. See MANUAL TRAINING.

Slugs, naked terrestrial molluscs, mostly of the family *Limacidæ*. The name is sometimes applied to other molluscs, and, wrongly, to certain insects which occur as pests in gardens.

Slug'worms, incorrectly called SLUGS, larvæ of sawflies, belonging to the *Hymenoptera*. They are sluglike in form. In the U. S. the pear, rose, vine, raspberry, walnut, linden, and other trees are infested with similar larvæ, which are very destructive. Decoctions of tobacco or quassia, whale-oil soap, a weak solution of carbolic acid, and petroleum are recommended for shrubs and trees infested with slugworms. For small trees and shrubs handpicking is generally sufficient.

Small Arms, the projectile arms which since the invention of gunpowder have replaced the bow and arrow and crossbow. The original firearms, bombards, were not portable, but in the fifteenth century lighter pieces came into use; even these required the service of several men, and were fired from a tripod. Of such guns the Duke of Orleans possessed 4,000 in 1411; in 1414 they were employed at the siege of Arras, and in 1471 were introduced into England. These hand cannon could be carried by two men, had a straight stock of wood about 3 ft. long, and were fired by a match. In Italy and Spain improvements received the names of hacquebutte, arquebuse, and mousquet; the stock was made curved, permitting aim to be taken from the shoulder instead of firing from the chest, and the weight was reduced to 15 lb. The tripod had now been replaced by a forked rest which the soldier carried as a cane. At the battle of Pavia the Spanish had 2,000 arquebusiers and 800 mousqueteers, whose fire determined the issue of the battle, the balls penetrating the best armor of the knights.

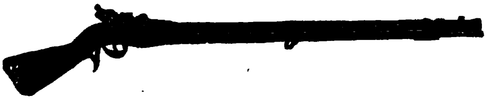


FIG. 1.—HALL'S BREECH-LOADING MUSKET, PATENTED, 1811.

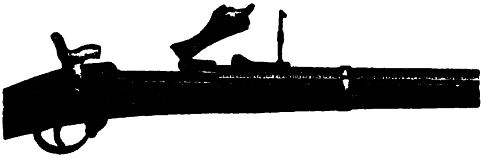


FIG. 2.—SPRINGFIELD RIFLE.

In the flintlock the weight was greatly reduced, and without material improvement remained during one hundred and fifty years the arm of the infantry, until in the nineteenth century the percussion cap was invented and rifles were substituted for smooth bores. The needle gun used by the Prussians in the war with Austria, 1866, demonstrated the superiority of the breech-loading over the muzzleloading rifle. The blunderbuss was a short, heavy, large-bored gun, used to discharge a heavy load of slugs or small bullets at short range. During the Civil War nearly 4,000,000 small arms were obtained, including nineteen varieties of breech-loading carbines and eight of rifles, those of Burnside, Sharps, Maynard, and Henry (the latter a magazine arm) being the best known.

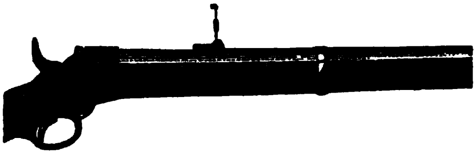


FIG. 3.—REMINGTON LOCKING RIFLE, MODEL, 1871.

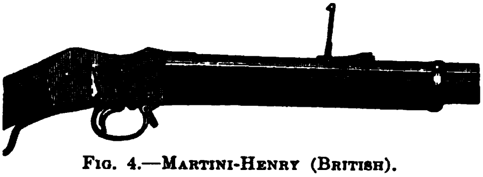


FIG. 4.—MARTINI-HENRY (BRITISH).

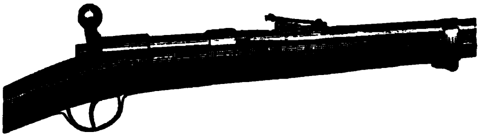


FIG. 5.—MAUSER (GERMAN).

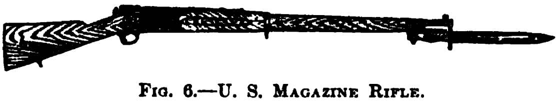


FIG. 6.—U. S. MAGAZINE RIFLE.

Since 1885 there has been a great improvement in small arms, the most important being the substitution of magazine arms for single loaders, the decrease in the caliber of the barrel, and the use of smokeless powder. The penetration of the bullet has been increased by the alteration in its shape, by its harder surface, and also by its more rapid initial movement. At the shorter ranges, 200 to 300 yds., protection is now obtained by 0.2 in. of steel plate and about 0.3 in. of wrought iron, and the penetration into earth at these distances is about 25 in., into pine about 30 in. Their effect upon the living human body is yet to be fully determined; probably if striking no bone the bullets will inflict wounds on three or four men in file, but wounds less serious than those from the heavier lead ball. Knives with blades 9 to 12 in. long have replaced the triangular bayonet. In 1892 the U. S. adopted a rifle invented by Capt. O. Krag and E. Jörgensen, of Norway. The modern rifle is effective at 4,000 yds., and capable of firing nearly forty shots per minute. A recent invention is the Maxim "silencer," a device which, when attached to firearms, renders their discharge noiseless. It is based on the principle of centrifugal force, and consists of a cylinder which, while having a direct hole in the center for the passage of the bullet, has twelve connecting vortex chambers through which the gas pencil which follows the bullet is successively forced by its expansion and constantly deflected until its power is exhausted. See MAGAZINE GUNS.

Small'pox, or **Vario'la,** a specific, contagious eruptive fever. Smallpox was unknown to the early Greek writers, but is mentioned in the oldest books of India—the Vedas—which describe inoculation with the secretion of the smallpox pustule as producing a mild form of the disease, and thereby preventing the dangerous natural form. Smallpox was known in Europe in the sixth century, and in the sixteenth century it was carried by the Spaniards to America.

The manifestations of smallpox are general illness, violent pains in the back and head, often a chill, high temperature, followed in three or four days by an eruption of papules (pimples), which in about four days more become vesicles, and then pustules. The pustules may break down into ulcers, which when healed leave pits of scar tissue, which have a characteristic appearance. In discrete smallpox the pustules are separate and distinct; in confluent smallpox the pustules run together, and form serious ulcers. Confluent smallpox is a severe type. With the appearance of the papules the fever abates, but the pustules are accompanied by a second rise of temperature, after which the symptoms progress toward death or recovery.

Smallpox is both contagious and infectious; that is, it may be derived from direct association with patients or by contact with articles which have been used by them. It may be spread from corpses. The disease has appeared after articles used by the sick have been handled, even after these articles have been removed to a long distance, and after a long time had elapsed. The smallpox germ has not been satisfactorily isolated. Unborn children have developed the disease, showing that it is transmissible through the blood of a mother. Previous to the introduction of vaccination, smallpox was one of the most dreaded of diseases, and millions lost their lives from its ravages. Since the general use of vaccination, and partly on account of improved hygienic conditions among all classes of society, the ravages of smallpox have diminished and only in few localities does it appear as an epidemic. The treatment of smallpox is principally symptomatic, that is, addressed to individual conditions. Violent medication has been abandoned. The patient is isolated, given digestible food, plenty of water, and cool and antiseptic applications are made to the skin. Among the most severe complications of smallpox are gangrene, boils, and blindness.

Smectym'nuus, name compounded of the initials of the authors of a tract entitled "An Answer" (1641), written in reply to Bishop Hall's "Episcopacy by Divine Right Asserted" (1641). The five writers were Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstowe.

Smell. See NOSE.

Smelt (in allusion to the cucumberlike odor of the typical species), a small salmoniform fish of the genus *Osmerus*, or a related genus, of the family *Argentinidæ*, and esteemed as food. *O. eperlanus* is the European species; *O. mordax*, the E. N. American, known also as frost fish. Among fishes improperly known as smelts are the cyprinoid *Hybognathus regius*, the spawn eater, and the Pacific tomcod.

Smelt'ing, the process of reducing metals from their ores by fusion, or processes in which an ore or a product of other operations, such as roasting, treatment with acids, etc., is reduced to pure metal. The fusions are conducted in shaft furnaces, reverberatory furnaces, or crucibles. Metals may be produced from ores by a single smelting operation, as iron; or they may require a series of smeltings, alternated with roastings, as copper when made from sulphureted ores. The smelting process may be simply reducing, or oxidizing and reducing, or may be designed to volatilize certain bodies, to oxidize others, and to reduce still others. Charcoal, coke, and anthracite are the fuels generally used in shaft furnaces and for heating crucibles, and bituminous coal and wood for reverberatory furnaces; but peat, natural gas, petroleum, and waste gases from furnaces are used.

Smer'dis, brother of Cambyses, who, envious of his strength, sent him back to Susa from Egypt. Shortly afterwards Cambyses, having dreamed that Smerdis was seated on the throne, had him put to death secretly. A rebellion broke out in Susa, and the brother of the governor of the palace, because he resembled the dead Smerdis, was declared to be the real Smerdis, and proclaimed king. In haste Cambyses returned to defend his throne, but died on the way, and though the nobles soon discovered the fraud, the false Smerdis was able to hold the throne for seven months. He was murdered by the nobles, who elected Darius Hystaspis king.

Smi'lax, large genus of monocotyledonous plants of the subfamily *Smilaceæ* and family *Liliaceæ*. They consist of herbaceous or shrubby plants, generally more or less climbing. There are about two hundred species scattered over the globe, most numerous in the temperate and tropical parts of Asia and America. True sarsaparilla and China root are among the products of the genus. The U. S. has numerous species, none important. The China brier is the most widely known of them. It is very frequent in the S. of the U. S., and extends N. to New Jersey. It has large, tuberous, brownish-red root stocks, which contain much starch. Formerly the Seminoles used the root stocks for food in times of scarcity. At present a kind of beer is made from them with molasses, parched corn, and sassafras. Several plants of this genus are fine in hothouse and garden culture. The climbing plant which under the name of smilax is cultivated by florists is the *Myrsiphyllum asparagoides*. It comes from the Cape of Good Hope, and is closely allied to the asparagus. It has a fine, threadlike stem, sometimes 20 ft. long, and elegant, strongly colored leaves which do not easily fade.

Smiles, Samuel, 1812-1904; English author; b. Haddington, Scotland; educated for the medical profession; became editor and railroad official. Among his numerous works are "Self-Help, with Illustrations of Character and Conduct," which had an enormous sale (1860); "Workmen's Earnings, Strikes and Savings"; "Lives of the Engineers"; "Character"; "Thrift"; "The Huguenots in England and Ireland"; "The Huguenots in France after the Revocation of the Edict of Nantes"; "Life of a Scotch Naturalist"; "George Moore, Merchant and Philanthropist"; "Life of Robert Dick" (1878); "Duty"; "Men of Invention and Industry"; "A Publisher and his Friends: John Murray"; "Josiah Wedgewood" (1894).

Smith, Adam, 1723-90; Scotch economist and philosopher; b. Kirkcaldy. Studied at Univ. of Glasgow and at Oxford. In 1751 was Prof. of Logic and 1752 Prof. of Moral Philosophy, Univ. of Glasgow. He resolved morals into (1) natural theology, (2) ethics, (3) justice with reference to specific rules and precepts, and (4) political expediency as affecting the honor, power, and prosperity of the state. His lectures were very popular. His first publication (1759), the "Theory of Moral Sentiments," led to his being selected to accompany the young Duke of Buccleugh on his travels. Smith thus had an opportunity to become acquainted with the internal policy of other states and to confer with distinguished economists. After his return in 1766 he lived for ten years in retirement. The result was his great work, "An Inquiry into the Nature and Sources of the Wealth of Nations."

Many principles it laid down were derived from the French economists, but the completeness of their compilation and his clearness of statement entitle Adam Smith to be regarded as the father of modern political economy. His book will continue to be a standard of reference. "Its great object is to demonstrate that the most effectual plan for advancing a people to greatness is to maintain that order of things which nature has pointed out, by allowing every man, as long as he observes the rules of justice, to pursue his own interest in his own way, and to bring both his industry and his capital into the freest competition with those of his fellow citizens." He was appointed a commissioner of customs for Scotland, and in 1787 was elected lord rector of the Univ. of Glasgow.

Smith, Edmund Kirby, 1824-93; b. St. Augustine, Fla.; graduated at West Point, 1845; participated in Mexican War, then (1849-52) Assistant Prof. of Mathematics, West Point. In 1861 became brigadier general Confederate States army, and was wounded at Bull Run. Under Bragg he led the advance into Kentucky; routed the Union forces at Richmond, Ky., August 30th, and advanced to Frankfort. Promoted to lieutenant general, he was engaged at Perryville, October 10th, and in the battle of Murfreesboro, December 31, 1862-January 3, 1863. He was soon after made general, and in command of the Trans-Mississippi Department, opposing Banks in the Red River campaign, and engaged at Jenkins's Ferry, April 30, 1864. He was the last to surrender the forces under his command, May 26, 1865. He was president Pacific and Atlantic Telegraph Company, 1866-68; president Western Military Academy, 1868-70; chancellor Univ. of Nashville, Tenn., 1870-75; Prof. of Mathematics, Univ. of the South, 1875-93.

Smith, Gerrit, 1797-1874; American philanthropist; b. Utica, N. Y.; graduated at Hamilton College, 1818; took up his residence at Peterboro, Madison Co., N. Y., devoting himself to the management of his great landed estate; became a member of the Colonization Society, 1825, but withdrew, 1835, when he connected himself with the American Anti-slavery Society, of which he was thenceforth one of the leading members; member of Congress, 1852. Was a liberal contributor to the Free Soil campaign in Kansas; gave pecuniary aid to John Brown, 1859; nominated for Governor of New York, 1840 and 1858, at the latter time on a platform of abolition and prohibition; joined Horace Greeley in signing the bail bond of Jefferson Davis, 1867.

Smith, Goldwin, 1823- ; English-American author; b. Reading, England; educated at Eton and at Oxford, where he graduated, 1845; fellow of University College, 1847; called to the bar, 1847, but never practiced law. Member of the popular education commission, 1858; Regius Prof. of Modern History, Oxford, 1858-66, and Prof. of English and Constitutional History, Cornell Univ., 1868-71. He championed the cause of the U. S. Govt. during the Civil War; visited the U. S. in 1864 to lecture. In 1871 he removed to Toronto, Canada; was for a time a member of the senate of Toronto Univ. Since his removal to Canada he has persistently advocated the annexation of that country to the U. S. In addition to numerous magazine articles he has published the following among other works: "Lectures on the Study of History," "Irish History and Irish Character," "The Empire," "Three English Statesmen," "Cowper," "A Trip to England," "Jane Austen," "Canada and the Canadian Question," "The Moral Crusader, W. L. Garrison," "The United States," "Bay Leaves," "Essays on Questions of the Day," "Guesses at the Riddle of Existence," and "Revolution or Progress?"

Smith, James, 1719-1806; a signer of the Declaration of Independence; b. Ireland. He came to America in 1729, and settled as a lawyer in York, Pa. He was a member of the Continental Congress, 1776-78, and when Congress held its sessions in York the board of war occupied his law office.

Smith, John, 1579-1631; adventurer and founder of Virginia; b. England. When young he took part in the wars in the Netherlands, and afterwards fought against the Turks, was taken prisoner, and sent as a slave to Constantinople. He was sent to the sea of Azov, whence he escaped to a Russian garrison on the Don. Smith returned to England and joined the expedition of Newport to Virginia, setting sail December 19, 1606. At the Canaries he was charged with a conspiracy to make himself king of Virginia, and was kept prisoner for the rest of the voyage. His trial resulted in his acquittal; he was admitted to his rights as a member of the council, and by his skill and energy saved the colony from destruction. On one of his expeditions into the country to obtain corn he was taken prisoner by the Indians, and his life was saved, it is said, by Pocahontas. In June and July, 1608, Smith explored the coasts of Chesapeake Bay as far as the Patapsco, and afterwards the head of the bay. He was now president of the colony, and administered its affairs with energy, restoring order and confidence. The company in England being dissatisfied, he was superseded, and returned to England, September, 1609.

In 1614 he explored with two ships the New England coast (so named by him). In 1615 he sailed again to New England to found a colony, but was captured by a French man-of-war, and carried to La Rochelle. He escaped, and on his return was appointed admiral of New England and wrote an account of his voyages to promote American colonization. The most important of his works are "The Generall Historie of Virginia, New England, and the Summer Isles" (1626), and "The True Travels, Adventures, and Observations of Captain John Smith" (1630). Some of his wonderful adventures, as narrated by himself, are probably, in part at least, fictitious.

Smith, Joseph, Jr., 1805–44; Mormon prophet; b. Sharon, Vt.; grew up almost without education, leading an idle and rather disreputable life. He began to have visions at the age of fifteen, and on September 21, 1823, the angel Moroni appeared to him, announcing that God had a work for him to perform, and that buried in the earth in a certain spot a few miles distant was a record inscribed upon gold plates, and with this record would be found a kind of spectacles through which alone the writing could be read. Smith described the plates as being inscribed on both sides with characters in a language no longer extant, but which he was able to decipher by the use of the miraculous spectacles, which he called the Urim and Thummim. Smith professed to have dictated in English the contents of these plates to Oliver Cowdery, the plates themselves mysteriously disappearing as they were transscribed, and the transcript was printed at Palmyra in 1830 as "The Book of Mormon, an Account written by the Hand of Moroni upon Plates taken from the Plates of Nephi. By Joseph Smith, Jr., Author and Proprietor," and to it was prefixed a certificate signed by Cowdery and two others that they had handled the plates. Later, all the witnesses declared the whole matter to be a hoax.

Smith aspired to found a new religion, and gained a small body of followers, and in 1831 went to Kirtland, Ohio, where he built a temple and set up a fraudulent bank. In 1838 they were driven away. Smith had in the meantime fixed upon a place in Missouri as the site of his New Jerusalem; but his adherents becoming obnoxious to the inhabitants, they abandoned their settlement and took refuge in Hancock Co., Ill., where in 1840 they established themselves at Nauvoo; in six years the population numbered 15,000. Here Smith soon began to put forth new revelations, among others one establishing polygamy as an essential of the Church of the Latter-Day Saints, and combining in his own person all civil, military, municipal, and sacerdotal authority. A newspaper was set up to oppose him; the presses were destroyed by Smith and his adherents; warrants were issued for his arrest; the Mormons armed themselves, and a conflict was imminent. They were committed to jail at Carthage, on an indictment of perjury and adultery. A mob assembled, dispersed the guard, and began firing into the jail. Hyrum Smith was shot dead; Joseph returned the fire with a revolver until his charges were exhausted, when he endeavored to escape, but was shot dead. He was succeeded by Brigham Young (*q.v.*). See MORMONS.

Smith, Samuel Francis, 1808–95; American author and editor; b. Boston, Mass.; graduated Harvard, 1829; edited *The Baptist Missionary Magazine*, 1832–33; Prof. of Modern Languages, Waterville College, 1834–42; edited *The Christian Review*, 1842–49. He published (with Rev. Baron Stow) *The Psalmist* (1843); edited a volume of "Lyric Gems"; wrote a "Life of Rev. Joseph Grafton," and is author of many well-known songs and hymns, including "My Country, 'tis of Thee" and "The Morning Light is Breaking."

Smith, Sydney, 1771–1845; English clergyman and author; educated at Oxford; was, in 1802, a founder and first editor of the *Edinburgh Review*. In 1807–8 appeared anonymously his "Letters on the Subject of the Catholics, by Peter Plymley," advocating Catholic emancipation, which, owing to an admirable mixture of sound sense, irony, and pleasantry, had an immense circulation.

Smith, William, 1769–1839; English geologist; "the father of English geology"; b. Churchill; as a mineral surveyor he made and published many maps of the succession of geological strata. He discovered and was the first to apply the principle of the classification and correlation of strata by means of their contained fossils. He received the first Wollaston medal from the Geological Society of London, and later a pension of £100 a year.

Smith Col'lege, institution for the higher education of women at Northampton, Mass., founded, 1871, by Miss Sophia Smith, who bequeathed for that purpose about $365,000. It was opened to students in 1875. It is nonsectarian in management and instruction. In 1909 there were 118 instructors and 1,609 students. The college library contains 30,000 volumes. Productive funds (1908), $1,320,000.

Smith'field, a locality in London, formerly used as a cattle market, but historically interesting as the place of execution of English martyrs, 1401–1612. Bartholomew Fair was held here.

Smith'son, James, abt. 1765–1829; English scientist; b. France; was a natural son of Hugh Smithson, first Duke of Northumberland; educated at Oxford, graduating in 1786 under the name of Lewis Macie; fellow of the Royal Society, 1787; devoted himself to science, especially chemistry and mineralogy, and published many papers. He was a friend and associate of many of the most learned men of his day. He lived usually in Paris, where he was an intimate of Arago. Sometime between 1791 and 1803 he took the name of Smithson. Died in Genoa, Italy. In 1904 his remains were brought from Genoa and reinterred at Washington. For an account of his munificent bequest to the U. S. see SMITHSONIAN INSTITUTION.

Smithson'ian Institu'tion, an establishment in Washington, D. C., for the advancement of learning under the patronage of the Government of the U. S., organized in 1846. Its founder was James Smithson, whose will contained the following clause: "I bequeath the whole of my property to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." It is probable that he was familiar with Washington's project for a national institution of learning. The phrase "an institution for the increase and diffusion of knowledge" occurs in Washington's farewell address (September 19, 1796).

There was opposition to the acceptance of the gift. Statesmen, led by Calhoun and Preston, argued that it was beneath the dignity of the U. S. to receive presents, and that the donor was seeking immortality for too moderate an equivalent. The acceptance of the gift was advocated by others under the leadership of J. Q. Adams. Richard Rush was appointed agent to prosecute the claim, and, owing to the generous tolerance of the British authorities, the matter was soon concluded. The legacy was received in the form of 104,960 sovereigns, which were delivered to the Philadelphia mint, and recoined into U. S. money, producing $508,318.46, the first installment of the legacy, which by 1867 amounted to $650,000.

Prof. Joseph Henry, for thirty years secretary of the institution, defines its objects as, first, to increase knowledge by research and study in science or literature, and, second, to diffuse knowledge everywhere, especially by promoting an interchange of thought among those prominent in learning in all nations. No restriction is made in favor of any one branch of knowledge. The leading features of the plan of Prof. Henry were "to assist men of science in making original researches, to publish them in a series of volumes, and to give a copy of them to every first-class library on the face of the earth." Probably there is not a scientific investigator in the U. S. to whom a helping hand has not at some time been extended by the institution, and the hand has often reached across the Atlantic. Books, apparatus, and laboratory accommodation have been supplied to thousands, and each year money grants have been made. Not less important has been the personal encouragement afforded and advice given in the tens of thousands of replies written each year in response to inquiries.

The value of the books distributed since the institution was opened cannot be much less than $1,000,000, estimating at standard publishers' rates. In return for its own publications, and by purchase, the institution has received the books which form its library, and which is one of the richest in the world in the publications of learned societies. The National Museum, the National Zoölogical Park, the Astrophysical Observatory, and many other valuable establishments are outgrowths of the Smithsonian Institution.

Smoke, the product of imperfect combustion. If coal, which is chiefly composed of carbon, hydrogen, nitrogen, and oxygen, be burned perfectly, the result will be carbonic acid, steam, and nitrogen, which substances will escape and blend with the atmosphere as invisible and incombustible gases. But as the ordinary combustion of coal is imperfect, inflammable gases and vapors and fine particles of carbon form soot and black and brown smoke, contaminate the air, and cause a loss of fuel. As coal smoke is a nuisance, and in large towns such as London even a serious evil, much attention has been paid to the burning of it. This is attended with practical difficulties, arising from the necessity of preventing the smoke from cooling and of supplying the combustible gases and vapors with the necessary amount of oxygen in order to make them burn with flame; but these difficulties are not greater than may be generally overcome. In some cities, as Washington, D. C., the pollution of the air by chimney smoke is forbidden by law.

Smoke'less Pow'ders, explosives acting without the production of smoke. They are: (1) Those composed of cellulose nitrate, either the insoluble or soluble variety, or both; (2) those composed of the constituents of 1 mixed with nitroglycerin or other organic nitrates; (3) those composed of the constituents of 1 mixed with nitro-derivatives of hydrocarbons, such as picric acid and the picrates. Each of these may contain oxidizing agents like barium or potassium nitrates and retarding agents such as tannin or lycopodium.

Among the most successful of these powders are of the first class indurite, used by the U. S. navy, and B. N., used by the French; of the second class ballistite, used by the Italians, and cordite, used by the British; and of the third class Peyton powder. These are smokeless because the products of their combustion are wholly gaseous, whereas fifty-five per cent of the products of the combustion of ordinary gunpowder is finely divided solids. While this property of smokelessness is a desirable property, and one which has modified strategy and tactics, the most valuable property common to these powders is the high velocities which they impart to projectiles. In order to minimize the strain on the gun the pressure developed must be kept within prescribed limits. The best powder gives the maximum initial velocity with the minimum chamber pressure; which gives uniform results when used under uniform conditions; and which undergoes no change, either chemical or physical, under the exposure incident to the military and naval service. One disadvantage of using smokeless powder is the corrosive effect it has on the gun. See Explosives.

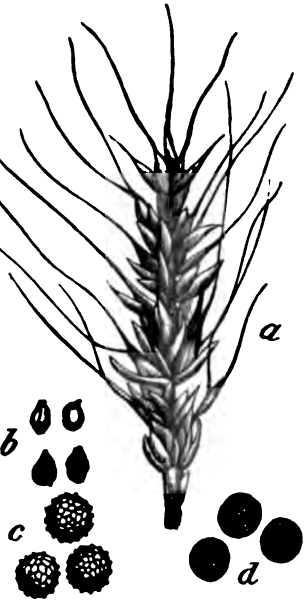
Smolensk', government of Russia, SW. of Moscow; area, 21,638 sq. m., generally extensive plains interspersed with morasses. The climate is cold, but healthful; the soil is fertile and well cultivated, yielding rye, hemp, and flax. Many fine cattle are raised, while its vast forests furnish valuable timber. Its manufactures are unimportant. Pop. (1907) est. at 1,795,200. Capital, Smolensk, on the Dnieper; pop. (1907) est. at 46,669.

Smol'lett, Tobias George, 1721–71; Scotch novelist; b. Dalquhurn, Scotland; studied at Glasgow, where he served an apprenticeship to a surgeon; went to London at the age of nineteen, with a tragedy, "The Regicide," which he unsuccessfully offered to the managers; was surgeon's mate in the navy; participated in the expedition against Cartagena, 1741; resided in Jamaica; returned to England, 1746; published in 1748, with success, his first novel, "The Adventures of Roderick Random," in which he made good use of his W. Indian experiences; published "The Adventures of Peregrine Pickle"; after seeking medical practice at Bath, settled at Chelsea, 1753, and wrote "The Adventures of Ferdinand, Count Fathom"; translated "Don Quixote"; issued "A Compendium of Authentic and Entertaining Travels," in which he embodied his own experiences; edited a Tory organ, *The Critical Review*; was fined and imprisoned three months for a libel on Admiral Knowles (1759); wrote in fourteen months a "Compleat History of England, deduced from the Descent of Julius Cæsar to the Treaty of Aix-la-Chapelle"; translated "Gil Blas"; wrote in prison his "Adventures of Sir Launcelot Greaves"; edited *The Briton*, in defense of Lord Bute; aided in issuing a translation of "The Works of Voltaire"; made a journey through France and Italy, 1763-66, which furnished materials for a work of "Travels"; satirized Bute and the elder Pitt in "Adventures of an Atom"; went to Italy, 1769, and wrote on the journey "The Expedition of Humphrey Clinker," his best novel.

Smollett ranks with Richardson and Fielding as one of the standard novelists of the eighteenth century, founders of the English school of prose fiction. He was influenced by Cervantes, Le Sage, and the group of Spanish "rogue" or *picaro* novelists. His stories deal with low life, travel, and broadly comic adventure, vigorous and racy, but coarse to the verge of brutality. In the persons of Commodore Trunnion, Jack Rattlin, Tom Bowling, and other nautical characters he introduced the British tar into fiction.

Smug'gling, the (statutory) offense either of bringing into a country articles prohibited, or of defrauding the customs revenue by secretly importing dutiable goods without paying such duties or without paying the full amount. In Great Britain the offense includes the exporting of goods with like intent, and (as often defined) the introduction of any articles into consumption without paying the duties chargeable upon them. In the U. S. the offense is within the federal power to regulate foreign commerce, and is defined as "the act, with intent to defraud, of bringing into the United States, or, with like intent, attempting to bring into the United States, dutiable articles without passing the same, or the package containing the same, through the customhouse, or submitting them to the officers of the revenue for examination."

The penalties are a fine of from $50 to $5,000, or imprisonment for not more than two years, or both; the contraband goods are forfeited, as may also be the vessel or other means used to import them. Resisting or hindering the revenue officers adds to the gravity of the offense. These officers are clothed with large powers of search, and may even, by court order, obtain an inspection of the books and papers of those suspected of or charged with the wrongful nonpayment of duties. When the property seized is condemned and sold, the net proceeds are distributed, part to the U. S., part to the principal customs officers of the district, and part to the informer if there was any distinct from the officer himself who detected the offense and procured the seizure.



Smut—*a*, Head of wheat affected by a smut; *b*, kernels filled with spores; *c* and *d*, spores of a smut.

Smuts, the *Ustilagineæ*, an order of minute parasitic fungi principally attacking the higher plants, and often producing serious injuries to farm and garden crops. In England they are sometimes known as dust brands. They consist of slender, branching, colorless threads, which grow through the tissues of their hosts, following the intercellular spaces, or penetrating and even filling the cell cavities. After a period of growth, the threads produce numerous spores, forming dark, dusty masses, which have suggested their popular name. No sexual organs are known in any of the smuts, and it is probable that the structural degradation due to excessive parasitism is so great that these organs have been lost. Smut masses should be burned, and seed soaked in water and treated with copper sulphate or potassium sulphide solution, to kill the fungus. See BLIGHT.

Smyr'na, city and vilayet of Aidin, Asia Minor, at the E. of the Gulf of Smyrna. Area of vilayet, 21,580 sq. m. Pop. (1908) 1,396,500. Were it not for the camels traversing its quay, the city of Smyrna with its modern edifices would be taken at first glance for a city of W. Europe. It still justifies its poetical names of Crown of Ionia, Eye of Anatolia, Pearl of the East.

Its origin is lost in myths. Tantalus, abt. 1500 B.C., is said to have founded it. It was colonized by the Greeks soon after the Trojan War. Taken and dismantled by Alyattes, King of Sardis (628 B.C.), it was rebuilt by Alexander the Great. It rapidly developed, and has since been the chief commercial city of Asia Minor. Here was one of the Apocalyptic churches. Captured by the Seljuk pirate Tzachas (1080), Smyrna suffered, but was soon retaken by the Greeks. The Seljuk prince of Aïdin conquered it (1313), but a crusading fleet drove out the Moslems. The Roman Catholic faith was introduced 1346, and the city has contained ever since many Catholics. Tamerlane, after defeating Bayezid I at Angora (1401), filled up the port, carried the place by storm, and butchered the inhabitants. Since 1424, when it was conquered by Murad II, it has been held by the Ottomans save that it was sacked by the Venetians in 1473. The site of the city, though always near the bay, has changed many times. Smyrna has suffered from earthquakes, notably in 177 (after which it was rebuilt by Marcus Aurelius), 1688, 1778, and 1880; and from plague, as in 1812 and 1837.

The streets run parallel with or at right angles to the shore. The houses are built of wooden beams encased in stone, as safer in fire and earthquake. Educational advantages are nowhere greater in the Ottoman empire. The principal exports are dried fruits, raw silk and cotton, opium, wheat, rice, valonia, oil, sesame, goatskins, carpets, wax, emery, cheese, beans, bones, mohair, etc. The exports average about $20,000,000 annually in value, and the imports about $15,000,000. Smyrna possesses some remarkable ruins, as the Genoese castle on Mt. Pagus, the theater lower down, the stadium and remains of the Temple of Diana. Pop. (1908) 201,000, of which half are Greeks, the rest being Turks, Armenians, Europeans, and Jews. Levantines, offspring of marriages between Europeans and natives, are numerous.

Snail, terrestrial shell-bearing mollusks generally. It has two pairs of tentacles on its head, its eyes being at the top of one pair. At the forward border of the creeping surface is an opening through which mucus is poured to aid the snail to slip along. Snails live on vegetable matter and do much damage. In France and elsewhere a species of snail is much esteemed as food. Both male and female organs appear in each snail, but they procreate by cross fertilization, and bury their eggs. See, further, GASTEROPODA.

AMERICAN SNAIL.

Snake'bird. See DARTER.

Snake Eel, marine eel of the genus *Ophisurus*, allied to the common eel, but found only in warm latitudes.

Snake In'dians. See SHOSHONEAN INDIANS.

Snake Plains, region in Idaho through which Snake River flows in a deep cañon, covered by successive eruptions of lava which came from fissures and deluged an area of 250,000 sq. m., including parts of Oregon and Washington. In Idaho the lava occurs in horizontal sheets resting on older volcanic rocks, and the streams flow beneath it, forming " lost rivers."

Snake Riv'er, a river which rises in W. Wyoming, flows W. across Idaho, and then N., between Idaho and Oregon, for 200 m., and between Idaho and Washington for 30 m. It then turns W. and joins the Columbia in Washington, near Pasco. Its length is between 800 and 1,000 m. In most of its course it is a rapid stream, flowing in cañons 1,000 to 3,000 ft. deep, with fine cataracts. It is navigable above. It flows through an arid region, the drainage of which has been rejuvenated by overflows of volcanic rock and probably also by recent elevations, and the gorge it has cut is still narrow and steep sided.

Snake'root, plants believed to cure snake bites. In the U. S. the name is applied to: (1) The black snakeroot or sanicle (*Sanicula marilandica*), a common umbelliferous plant, with a root of an aromatic taste, used as an antispasmodic. (2) *Eryngium yuccæfolium*, button snakeroot, or rattlesnake master, a diaphoretic and expectorant. (3) The Seneca snakeroot. (4) *Liatris spicata*, (5) *L. squarrosa*, and (6) *L. scariosa*, called also button snakeroot, blazing star, rattlesnake master, etc., showy composite-flowered plants, with stimulant and diuretic properties. (7) *Eupatorium ageratoides*, common in the N. states and a good tonic, called white snakeroot. (8) *Aris-*

tolochia serpentaria, the Virginia snakeroot, a valuable stimulant and tonic and of pleasant fragrance. (9) *A. reticulata* of the SW. has properties similar to Virginia snakeroot, and produces much of the snakeroot of commerce. (10) *Cimicifuga racemosa*, black snakeroot, is a sedative and expectorant. (11) *Asarum canadense*, wild ginger, is called snakeroot and Canada snakeroot in New England; it is fragrant, with properties like *A. serpentaria*, but more pungent.

Snakes. See SERPENT.

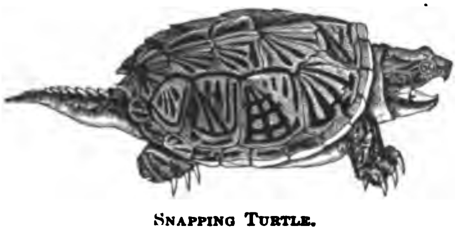
Snake'stone, a piece of stone, bone, or other substance placed upon the bite of a serpent to absorb or charm away the poison. The vulgar in almost all countries have faith in such cures as the madstone, which is applied to the bite of a rabid dog. In India there are apparently authentic instances of the efficacy of snakestones. It is possible that the stones may have a strong absorbtive power, for they are often porous, and the faith which the victims have in this cure is doubtless a powerful adjuvant.

Snake'wood. See LETTERWOOD.

Snap'dragon, any plant of the genus *Antirrhinum*, family *Scrophulariaceæ*. The snapdragons are annuals and perennials, and many fine flowering varieties are cultivated.

Snap'per, fishes of the family *Lutjanidæ*. They inhabit warm seas, and are carnivorous. The red snapper (*Lutjanus aya*), of the Gulf coast of the U. S. in deep water, is an important food fish. The mangrove snapper, or gray snapper (*L. griseus*), ranges from the W. Indies N. to New Jersey, and is abundant along shore among mangroves. The name is improperly applied to the rosefish (*Sebastes marinus*), the bluefish, and others.

Snap'ping Tur'tle, in the U. S., one of several species of tortoises. (1) The common snapping turtle of the N. and most of the S. states is the *Chelydra serpentina*. This has the head moderately large, and covered with a soft skin, and the marginal scales of the shell are in a single row. It rarely attains 4 ft. and a weight of 50 lb. It is found from Canada S., and from the Atlantic seaboard W. to the plains. (2) A species which in some parts of the S. states replaces the *C. serpentina* is the *Macrochelys lacertina*. This animal has the head very large and broadly triangular, and it is covered with horny plates; the marginal scales of the shell are in two rows. It reaches a large size, sometimes weighing 100 lb. It is confined to the S. states, from Florida to W. Texas, and N. up to Missouri. It is known as the alligator snapper. These are distinguishable from other turtles of the U. S. by the long and imperfectly retractile neck and tail, and the cruciform plastron or lower shell. Their popular name is due to the habit of snapping at food or enemies. Their bite is severe, and it is difficult to relax their hold. They are esteemed for food, especially for soup. They have a strong musky odor. In the early summer they lay from 20 to 40 eggs in a hole dug by themselves. (3) The name is locally applied to the soft-shell turtles, or *Trionychidæ*, which snap abruptly at food or other objects.



SNAPPING TURTLE.

Sneeze'wood, the timber of the *Ptæroxylon utile* (family *Sapindaceæ*), of S. Africa. When sawing it, joiners are much troubled by the sneezing which its fine dust provokes.

Sneez'ing, or **Sternuta'tion,** a convulsive movement by which the lungs and chest walls are expanded and then suddenly contracted, forcing the breath out violently through the nose. It is produced by reflex action, there being some irritation of the membrane of the nose which originates the action. Sneezing tends to remove irritants from the nose. As a symptom of cold, it indicates catarrhal inflammation. In children measles may begin with this symptom, and influenza is also frequently so initiated. Sneezing due to irritation of pollen is a distressing symptom of hay fever. The use of sternutatories, such as snuff, was long a popular method of "clearing the head."

Snipe, any bird of the *Scolopacidæ*, including shore birds or sandpipers, and commonly restricted to the 20 marsh-haunting species of the genus *Gallinago*, which are widely distributed. They have a straight bill, longer than the head, grooved to the end, which is slightly expanded, well supplied with nerves and used in probing the mud for worms. The eye is placed far back, over the ear. The plumage is streaked with buff and brown, black and white, and blends completely with the ground. The tail feathers vary from 12 to 26. The American snipe (*G. delicata*) is found over the greater part of the U. S. In winter it migrates as far S. as Brazil. It is sometimes

COMMON SNIPE.

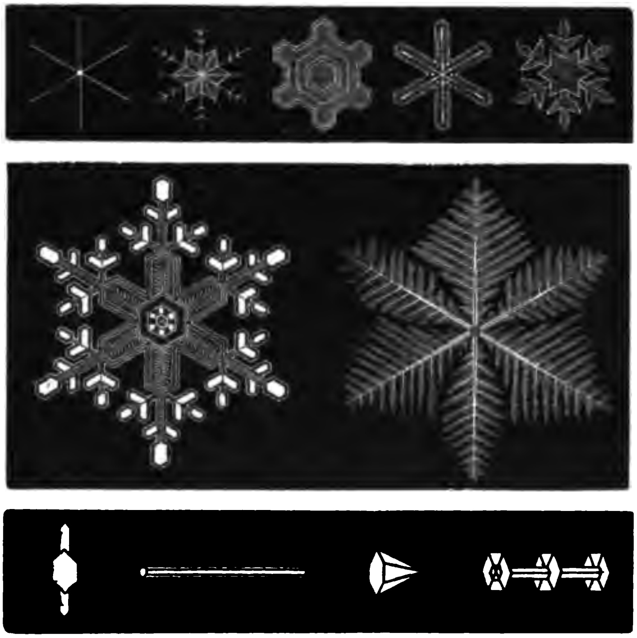
called English snipe; but that bird, although similar, is a distinct species (*G. gallinago*), which does not reach N. America, although found in Greenland. The jacksnipe of Europe (*G. gallinula*) is the smallest; the great snipe of E. S. America (*G. gigantea*) is the largest.

Snor'ri Stur'luson, usually written SNORRE STURLASON, 1178–1241; Icelandic historian; b. Hvam; belonged to the powerful clan of the Sturlungs. He was speaker of laws, and for several years was the richest and most influential man in the land. He became involved in feuds and litigation with his relatives and others. In 1218 he visited Norway, and was received by the young king, Hakon Hakonson. In 1219 he visited the lagman Eskil in Sweden, and there he must have obtained that knowledge of Swedish affairs which appears in his writing. In 1220 he returned to Iceland, after having promised to work for the subjugation of Iceland to Norway. As he made no progress he was suspected of faithlessness, and his enemies in Iceland took advantage of this to ruin him.

After endless feuds, Snorre went to Norway in 1237, but he lost the good will of Hakon and returned to Iceland. On his arrival there he got into trouble with his son-in-law, Gissur Thorvaldson, who, at the instigation of King Hakon, murdered him at his home. Snorre was Iceland's most distinguished sagaman, and he enjoys some reputation as a skald. As a writer of history he ranks with Herodotus and Thucydides. His "Heimskringla," embracing an elaborate history of the kings of Norway to the death of Magnus Erlingson in 1177, is famous. The "Younger Edda" also bears Snorre's name, and is to a great extent his work.

Snow, the spicules of ice into which atmospheric vapor is condensed. These snowflakes assume a variety of crystalline forms, but usually present the outline of a hexagon or a six-pointed star. (See ICE.) In high and middle latitudes the ground is covered with snow each winter, but within the tropical regions no snow falls at or near the level of the sea, for the temperature of the lower atmosphere is always sufficient to melt it, even if it is formed in the upper air. As the heat of the air decreases upward, the formation of snow is always possible upon high mountains, even under the equator. At the summit of the Andes and the Himalayas the moisture condensed during the rainy season falls as snow, while it rains on the slopes and plains below. In all latitudes from the equator to the poles the tops of high mountains are permanently covered with snow, which the summer heat is not sufficient to melt. The lower limit of perpetual snow, called the *snow line*, varies in altitude in the different portions of the globe. Within the tropics it is about 3 m. above sea level; in temperate latitudes it descends to below 2 m.; and at the N. limits of the continents it is half a mile, or less, above sea level; while on the Arctic islands vast fields of snow remain permanently near the seashore. See GLACIERS.

RED SNOW, real snow tinted by the presence of *Hæmatococcus lacustris* (or *Protococcus nivalis*), microscopic algæ of the order *Protococcoideæ*. The cells are subglobose, and about $\frac{1}{500}$ in. in diameter. In 1819 Ross found banks of red snow on the E. shore of Baffin Bay extending for miles, and these were in some parts 12 ft. deep.



SNOW CRYSTALS.

Snow'ball, the *Viburnum opulus*, a cultivated shrub of the *Caprifoliaceæ*, called also Guelder rose. To this species belongs the highbush cranberry of the U. S., whose fruit is edible. The species is native to Europe and N. America. The Japanese snowball is *V. tomentosum* (*V. plicatum* of nurseries).

Snow'berry, the *Symphoricarpos racemosus*, a handsome shrub (family *Caprifoliaceæ*), common in the U. S. and naturalized in European shrubberies. It has persistent, white, inedible berries. The name is also given to *Chiogenes hispidula* (family *Ericaceæ*), a creeping woody plant, whose leaves and white edible berries have the taste of the checkerberry (*Gaultheria*). It is common in the N. parts of the U. S. and Canada.

Snow'bird, species of the genus *Junco*, family *Fringillidæ*, and have a small conical bill, the wings rather short; the color is blackish or ash above, white on the belly, and not developed in streaks; the outer tail feathers are white. They are about 6 in. in length, of which the tail forms a half. They are distributed over the U. S. They are mostly birds of passage in the E. and Middle states, as the majority go N. to breed while yet snow may be on the ground, and return in the late fall. They feed on seeds and berries. The name is applied to the snow bunting (*Plectrophenax nivalis*), a little finch of high N. latitudes and seen sometimes in vast flocks. The back is gray, tail and wings black and white, under parts white. In breeding plumage the back and bill are black, and there is more white in the plumage than in winter.

Snow'drop, the *Galanthus nivalis* (family *Amaryllidaceæ*), a small herb much cultivated for its snow-white flower, appearing in earliest spring. A native of the Alps, it is naturalized in N. Europe and in the U. S. A larger species, *G. imperatri*, is also grown.

Snowdrop Tree, either the *Halesia tetraptera* or the *H. diptera* (*Styracaceæ*), small trees or large shrubs native in the S. parts of the U. S. They bear showy white clusters of flowers, which appear in spring somewhat before the leaves. They are very fine in cultivation.

Snow'flake, European herbs of the *Amaryllidaceæ*, cultivated in the U. S. They are hardy bulbous plants with white flowers. The bulbs have long been employed as an emetic.

Snow'shoes, footwear worn in Canada and elsewhere, consisting of an oval frame like a tennis racket. The Scandinavian skee is a long strip of wood, a few inches wide, curved up in front, and used as a snowshoe or skate. The object of these is to secure a larger foothold, and so prevent the wearer from sinking into the snow.

One Type of Snowshoe.

Snuff. See Tobacco.

Soap, any salt of the fatty acids with a metallic base, usually a soda or a potash. All the true oils and fats are decomposed by alkaline hydrates, by certain metallic oxides, and also by acids, high steam, and hot water. In the decomposition of fats by alkalies the products formed are glycerin and the alkali salts of the fatty acids. This process is known as *saponification.* As a rule, soaps produced from soda are *hard soaps,* while those produced from potash are *soft soaps.* Castor oil forms with potash a hard and brittle soap. A distinction between the hard and soft soaps is that in the former the glycerin is removed in the mother liquor or spent lye, while in the latter it remains mingled with the semi-fluid mass. Moreover, it is not possible to dry the potash soaps, owing to the hygroscopic character of the base, while soda soaps may be dried so as to admit of grinding to powder. Formerly the clearing of forests provided a plentiful supply of potash, but the cheap production of soda by the Leblanc process has practically stopped the making of potash soaps.

In making soap with caustic potash and stearin (glyceryl stearate) the products are glycerin and potassium stearate; thus:

Stearin. 3 molecules pot. hydrate Glycerin. 3 molecules of potassium stearate.

$$\left.\begin{matrix}(C_{18}H_{35}O)_3\\(C_3H_5)'''\end{matrix}\right\}O_3+\left.\begin{matrix}K_3\\H_3\end{matrix}\right\}O_3=\left.\begin{matrix}(C_3H_5)'''\\H_3\end{matrix}\right\}O_3+\left.\begin{matrix}(C_{18}H_{35}O)_3\\K_3\end{matrix}\right\}O_3$$

The alkaline liquor (lye) is added to the neutral fat or oil in large soap pans, and the mixture heated. Resin is sometimes added, as it gives the product more than its value in weight and volume. Then, by the addition of salt, the emulsion of oils and alkali is decomposed, the salt taking the water and causing the precipitation of the newly formed soap in a curdy state, floating on the dense spent lyes in which is found the glycerin and salt, and no alkali. The soap is again boiled, skimmed, and placed on frames to harden.

The principal classes of soaps are those made from vegetable oils and those made from animal oils and fats. Marseilles or Castile soap is made of olive oil, with rape-seed oil to prevent crumbling. The richness of the olive oil in margarin or palmitin, and the freedom from animal odors, account, in part, for the excellence of this soap. Cocoanut-oil soap, or marine soap, is not easily decomposed by weak saline liquors, so it is used to wash in salt water. Common yellow or rosin soap is a serviceable soap, which lathers well and is cheap.

In domestic economy it is a practice in New England and New York to saponify the drippings of the kitchen, chiefly beef and mutton suet, with the crude potash of commerce in the cold. The following receipt is traditional for domestic soft soap: Fat, 12 lb.; potash, 9 lb.; water, 12 gal. The fat and alkali are placed in a cask, and water added, 3 gal. at a time, boiling hot, once in twenty-four hours, until all is used. Saponification sets in soon, but is not completed until after many days, and is hastened by stirring with a strong stick. When saponification is complete all lumps of unaltered fat disappear, the soap has a silky luster when stirred, and the consistency of a jelly, trailing off in slender threads from a stirrer, and is a powerful detergent for the coarser purposes of the household.

Toilet soaps are made from pure and sweet materials—sweet almond oil, beef marrow, refined sweet lard, saponified without heat and perfumed with essential oils. Pure curd soap is also used for the foundation of toilet soaps, for which purpose the soap is reduced to thin shavings, melted over a water bath with rose and orange-flower water and common salt—24 lb. of soap, with 4 pints each of rose and orange-flower water, and 8 oz. of salt. Shaving cream is made by beating up lard with one and a half times its weight of potash lye, and perfuming and coloring. Glycerin soap is prepared by mixing glycerin with a toilet soap, or with the transparent soap produced from its solution in alcohol. It mollifies the skin in cold weather. Soap was not known to the ancients. It is first mentioned by Pliny, who refers to it as something used by the Romans to beautify the hair. Geber in the second century states that soap was prepared from tallow with potash and lime. It is stated further that soap is used as a medicine, and that by means of it all dirt could be removed from the body and clothes.

Soap'stone. See STEATITE.

Soap'wort, plants of the *Sapindaceæ*, sometimes so called from the soapy quality of their fruits. Plants of the genus *Saponaria* (family *Caryophyllaceæ*) and other plants of the same family, which are also sometimes utilized for their detergent powers. There are many vegetables which are excellent substitutes for soap. This cleansing power sometimes depends upon the principle saponine, found in plants of widely diverse families.

Sobies'ki. See JOHN III, SOBIESKI.

Soc'cage, or Socage. See TENURE.

So'cial Con'tract, or Social Com'pact, an exploded theory, first fully stated by Rousseau, that society originated by the coming together of men in convention consciously to bind themselves into a community or state. The theory took for granted a previous unsocial existence, and overlooked the gradual evolution of society.

So'cialism, a conscious endeavor to substitute organized coöperation for existence in place of the present competition for existence. Socialists are divided into several schools, each with its own shades of opinion. This article will, therefore, endeavor to present the main lines of thought and the conclusions upon which most socialists are agreed.

Primitive society was founded upon communism, or common ownership of the means of production and of the products. With the institution of private property the destruction of the communal form of life and all that this involved was inevitable. But during the period of communism all the inventions and discoveries which form the foundation of the modern system of machine production were placed at the disposal of mankind. The domestication of animals, the growth of cereals, the wheel, the potter's wheel and pottery, the canoe and sail, weaving, dyeing, the use of the stencil plate, the mining and smelting of metals—each and all of these were in use under communism. The names of the inventors are unknown, and the circumstances under which they lived prevented them from deriving any individual advantage from their superior ingenuity. Exchange, in the modern sense, was unknown.

As the power of man to produce wealth increased further progress in wealth production was hampered by these communal forms, and by the necessity incumbent upon each member of the tribe to perform his share of the communal duty. When, also, it was discovered that the captives from neighboring tribes could produce by their labor more than was necessary to maintain themselves in health and strength, there was a strong economic reason for keeping them alive, in the service of the conquering tribe or its chiefs, in place of butchering them on the spot or reserving them for cannibal banquets. Though the slaves were often more numerous than their masters, they scarcely thought of achieving freedom. The division into castes and classes followed. The extension of trade led to the rise of the merchant class. In the Middle Ages the slave was replaced by the serf. Then arose the free peasant cultivators and the city craftsmen. Owing to historic and economic causes, these free individual owners and craftsmen were gradually deprived of their private property and independence, and were driven as wage-earners to produce goods no longer primarily for use but for exchange. Previously production for exchange and profit had been the exception; now it became the rule. The personal relations which, in the main, had dominated over the old civilizations became mere pecuniary relations, and thenceforth pecuniary considerations were supreme in society.

The change to the modern competitive system was gradual. Instead of individual production, generally for individual use or for the local market, only the surplus coming into exchange, production itself assumed a social form, and the local market widened into the national and international market. The members of the wage-earning class possessed, nominally at least, liberty to do what they pleased; but, having no property, they were compelled to sell their labor to those who would hire it. But these workers had no share in the ownership of the raw material, no say in the quantity or quality of the articles produced, no control over the finished product, which belonged to the master. They received as wages that which represented on the average their cost of subsistence, in accordance with the standard of life of their class, so long as their employer required their services. What then had happened? Production had become social, but appropriation and exchange remained at the entire disposal of individuals.

This initial antagonism lies at the root of all the antagonisms of the modern system of capitalist and wage-earning production for exchange and profit. Competition ruled the market. Competition by free, propertyless wage-earners below; competition for increased profit by capitalists and employers above. The latter were driven to sweep aside the old local restrictive laws, and, as they gained strength, they substituted their own commercial control in politics for that of the classes theretofore supreme. Thenceforward all improvements and inventions went into the hands of the capitalist class and were shared by them, unwillingly, with the landlords. Such was the course of events in Great Britain, where the economic transformation was soonest effected, the removal of the people from the individual or collective ownership of the soil having first been carried out. Socialists claim that with the factory industry, founded on the inventions of Watt, Hargreaves, and others, the last great system of human slavery was established, and that the cruelty and physical degradation by which it has been invariably accompanied fully equal chattel slavery and serfdom.

The conflict for the markets of the world has prepared the way for a closer understanding between all races and nationalities. The slow economic development which arises out of the institution of private property is thus approaching its close, and we are on the threshold of the most crucial transformation that the world has ever seen. The distinguishing feature of the capitalist system of production from all previous systems is that it is carried on primarily for profit and exchange. Goods are of no immediate use to those who produce them. They are made to go upon the market under the control of the employer, who must sell them for cash in competition with others, who likewise sell for cash. Cheapness being the determining force in the commercial conflict, each manufacturer must cut down his cost of production to the lowest point so that he may undersell his rivals.

The commodity which the wage-earner sells —his power to labor—produces more value than the worth of the wages which he is paid. From this surplus labor-value incorporated in commodities the employer derives his profit, the landlord his rent, the commission agent his brokerage, the banker his interest, and so on. It is the unpaid labor of the wage-earners —the labor which they give in excess of the value of the wages they receive—that enables the capitalist class and their associates to pile up riches and capital. Individual capitalists may run risks, but a profit for them as a class is certain; but in order to enhance this profit in circumstances where they are pressed by the competition of their fellows, they have reduced wages, lengthened hours of labor, introduced improved machinery, and turned out as much goods as cheaply as possible, so as to obtain a larger sale. The wage-earners being obliged to compete with one another for the sale of their sole commodity, labor power, often accept lower wages because they must do this or starve. The success of the employer seems a necessity of existence to them, and a large employer of labor for profit is often regarded as a public benefactor; but the interests of the wage-earning class and the capitalist class cannot be in reality identical, though it may be and is to the temporary interest of a particular set of wage-earners that their own individual employer should be successful.

Organized industries call for thorough organization, and anything in the shape of unpunctuality or dereliction of duty on the part of the employees is fined. It is essential, from the profit-making point of view, that there should be no waste of time, and that the plant, mechanical and human, should work with regularity. But this complete organization of production finds its correlative opposite in the anarchy of the exchange when competitive capitalism is in full swing. Each fights for himself. Moreover, the capitalist system of production has developed an antagonism between the sexes, and even between parents and their children. The family, in its ancient sense, has been disrupted, and men are compelled to compete for wages by women who, owing to a variety of causes, accept a lower standard of life and a lower rate of wages. Children in many countries compete against men and women. Of the antagonism between skilled and unskilled labor, between casual, unorganized workers and trade unionists, between employed and unemployed, it is unnecessary to speak.

Ever since the capitalist system became predominant, ups and downs of trade, periods of inflation alternating with depression, have been the rule, and they are taken for granted by men of business, who base their calculations upon such variations. The remarkable feature in all the cataclysms from 1815 to 1907, before as after the use of steam vessels, railways, and telegraph cables, was that they were preceded and accompanied by an excess of products. In previous economic epochs, as in barbarous countries at present, general depression of trade has arisen from drought or flood, from bad harvest or pestilence. Only among the most civilized peoples does an excess of what the world requires become a cause of stagnation, and the reason why workers are prevented from earning their livelihood.

At this point socialism claims that the antagonisms inherent in the capitalist system must be solved by making exchange social, as production is social; by establishing coöperative production and distribution in the place of competitive wagedom and competitive capitalism. The formation of companies of bondholders and shareholders, to carry out public works, and the transformation of many private concerns into similar companies, form a distinct move in the direction of socialization. The individual employer is merged in a multitude of shareholders, and the pecuniary relation becomes the sole tie between employers and employed. Furthermore, these companies are minimizing competition by combination. Banks are consolidated, nationally and internationally; shipping companies agree not to compete; joint-stock associations form trusts and "rings." Human nature assumes a higher character in a society in which life is not a constant struggle against want and misery. Instead of the personal, limited, introspective individual ethic is the social, altruistic, broad ethic in which the duty toward society necessarily involves the highest duty toward a man's self. Woman, relieved of economic and social subjugation, will assume her place as the social equal of man. So far, therefore, from individual initiative and personal freedom being limited, human beings will have the opportunity for attaining to a level of physical, moral, and mental development such as the world has never seen. The golden age of human society is, indeed, not in the past but in the future.

The destruction or transformation of class government and the abolition of wagedom, which socialists look forward to as the next stage in the development of human society, will give free outlet to the individual; while the attempt to secure the supremacy of the individual by mere individual effort, if it could be realized and made effective, would but deprive mankind of the vast collective powers of production now available. Socialism and anarchism are directly opposed, alike as to theory and tactics; their only point of agreement is that both are in antagonism to our present society.

So'cial War, the war (90–89 B.C.) between Rome and her Italian allies. The latter, who had for nearly two centuries shared the burdens and dangers of the republic, justly demanded the privilege of the franchise. After the assassination of M. Livius Drusus (91 B.C.), who desired to grant citizenship to the Italians, the allies, including the Marsi, the Peligni, the Lucanians, the Samnites, and others, rose and proclaimed a new republic. A bloody war followed, and notwithstanding the great victories of Sulla, Marius, L. Cæsar, and others, the Romans were compelled to make concessions. Over 300,000 men are said to have been slain in this war.

Soci'ety Is'lands, or **Tahi'ti Archipel'ago,** a group of islands in the S. Pacific Ocean, including the French establishments in Oceania, and the Marquesas, Tuamotu, Gambier, and Tubuai groups and Rapa Island. They consist of one large island, Tahiti, and small isles; total area, 650 sq. m., with 13,255 inhabitants; In the center some of the islands rise to 6,000 or 8,000 ft., but all have a belt of low land extending between the foot of the mountains and the sea, and are generally surrounded by coral reefs. The soil is fertile and the climate delightful. The inhabitants are Polynesians; most of them Christians. The capital of the colony is Papeete. The chief exports are mother-of-pearl, copra, cotton, and vanilla. Sugar and coffee also are produced.

Society of Friends. See FRIENDS, SOCIETY OF.

Society of Je'sus. See JESUITS.

Socin'ians and Socin'ianism, the historical designations of the advocates and doctrines of an organized system of anti-Trinitarianism. In the U. S. the names have given place to Unitarians and Unitarianism, names of wider scope. Lælius Socinus (1525–62), b. Siena, has been called "the spiritual father of Socinianism," while his nephew, Faustus Socinus (1539–1604), was the founder of the sect. Socinians accept the Scriptures as divinely revealed, but hold that Adam's guilt is not imputed, and that responsibility is limited by ability. They hold that: (1) The divine unity is inconsistent with personal distinctions. (2) Free self-determination is more fundamental in the divine nature than either justice or love. (3) By the act of creating the world, God has voluntarily limited His omnipresence as to His essence, and by creating free agents He has voluntarily limited His power and His knowledge, because free will is self-determined, and future contingent events are not the objects of knowledge. (4) There is no such justice in God as requires absolutely and inexorably that sin be punished. Hence He can pardon any repentant and reforming sinner without a satisfaction to justice. (5) The Holy Ghost is the impersonal power and efficacy of God.

In practical ethics Faustus Socinus was humane—opposed to war and capital punishment. The system of Socinus was remarkable for its radical departure from traditional theology. Even the English Unitarians of the eighteenth century, who were Socinian rather than Arian, were much more cautious and conservative than Socinus, while the early Unitarians in the U. S. were generally Arians, regarding Jesus as a being *sui generis,* and only a little less than God.

Sociol'ogy, the science of society, which occupies itself with the elements and first principles of social phenomena, and leaves to ethnology, demography, political economy, comparative jurisprudence, the theory of the state, the study of religions, and other special social sciences a detailed investigation of particular groups of social facts, all of which have their ultimate interpretation in sociology.

Systematic sociology is not an abstract science, tracing the operation of particular social forces through all their ramifications, but a concrete science, descriptive, historical, and explanatory, concerning itself with the organization, activities, and evolution of those bands and nations into which the populations of the world are distributed. Sociology is the fundamental social science, because it includes the elementary and preliminary descriptive matter which is presupposed by all the special social sciences.

Systematic sociology begins with analysis, classification, and generalization. The elements of society are all included under the term population, which must be studied under its aspect of numbers, reproduction, increase, density, migrations, and the intermingling of races and nationalities, and under its aspect of sympathies, antagonisms, tolerances, habits, and character. The social composition includes the family, the horde, the tribe, the town, the county, the commonwealth, and the nation. The other form of organization may be called the social constitution. Its basis is a division of labor, and it consists of associations engaged in different activities, some economic, some political, some cultural, but all coördinated. The study of population begins with the facts of aggregation or grouping. Aggregation is of two forms. Individuals descended from a common ancestry are often found living near each other in and about the place of their birth. This is a genetic aggregation. Other individuals born in many different places are found carrying on their life activities in one place, as in London or New York. This is a congregate aggregation.

Turning to the psychical factors of society, the most elementary phenomena of social psychology are simple activities of feeling, perception, and will that involve two or more individuals, namely: (1) Mutual perception and communication, by motions, tones, or speech; (2) recognition of fellow beings of one's own kind or species as like oneself and unlike all other objects; (3) imitation; (4) conflict; (5) toleration; (6) mutual aid, alliance; (7) mutual pleasure, play, festivity. These constitute association as distinguished from the merely physical phenomenon of aggregation.

Association reacts on the associated individuals, developing in them a social nature; but owing to differences of circumstance and of heredity the development does not go on equally, or at the same rate, in all parts of the population, and social classes result. In a majority of individuals fellow feeling, imitativeness amounting to industry, tolerance amounting to justice, helpfulness, and companionableness, are ruling qualities. This class is the normally social. In other individuals these qualities are deficient or absent, but are simulated. Pretending to have the social nature and appealing to those in whom it is real, these pseudosocial characters, if not aggressively antisocial, make up the pauper class. Yet others, whether simulating the social nature or not, having become aggressively antisocial, are the criminal class. The foregoing mental and moral elements of society are combined in products which we call the common feeling, the moral sense, the public opinion, the general will, of the community, and which it is convenient to name collectively the social mind or the social consciousness.

The social integration of desire, belief, and will, which constitutes this mind, is effected sympathetically or rationally; passionately and violently, or deliberatively. One mode is seen in fads or crazes, panics, emotional revivals, mobs, lynchings, riots, violent revolutions. The other is seen in the proceedings of a parliamentary body, the execution of legal justice, the movements of a disciplined army. The primary products of the social mind are social choices and values. These are further combined with reference to the phases and interests of life into standards of living and of industry, rules and methods of art, laws of conduct, political policies, religious faiths, scientific doctrines, ethical ideals, all of which, being handed on, become traditions. The primary traditions are: (1) The economic, consisting of the whole body of knowledge and usage pertaining to material well being; (2) the juridical—the customary and positive law; (3) the political—the political history, policy, and aspirations of a state. Secondary traditions are the lingual, æsthetic, religious, scientific, and ethical.

In the social structure small groups are combined into larger groups, and these again into groups yet larger. The unitary group in societies of the higher animals, or of men, is the family, which may be a temporary or an enduring union of one male with one female and their offspring, or of one male with two or more females (polygamy), of one female with several males (polyandry), or of several males with several females (punaluan or communistic marriage).

Human societies composed of families grouped in larger aggregates are of two types. Ethnical societies are genetic aggregations; a real or fictitious blood kinship is the chief bond. Demotic societies are groups of people bound by habitual intercourse, mutual interests, and coöperation, without regard to origins or genetic relationships. Ethnical societies are the earlier, and among them many are metronymic, kinship being traced through the mother name only. Others are patronymic, with the kinship traced through the father name only. The smallest ethnical society is the horde, a group of from three to thirty families, dwelling together in a camp or village. The Bushmen, Fuegians, and Inuits afford examples. The next larger group is the tribe, probably originating in an alliance of several hordes for defense or aggression. Horde and tribe are often confounded with the clan or gens. The horde and the tribe includes all of its descendants who dwell in the parent camp, while the clan is a partly natural, partly artificial brotherhood and sisterhood, which rigidly excludes all of the descendants of its sons if metronymic, or all the descendants of its daughters if patronymic. Related tribes speaking dialects of the same language, when they confederate, are a folk or ethnic nation.

In demotic society the smallest community is the deme, village, or township. Townships are combined into counties, counties into commonwealths, commonwealths into federal states.

It is an error to attribute to the state defensive and juridical functions only, and to private associations economic and cultural functions only. The fact is that the state performs always important economic functions of production, transportation, exchange and finance, and cultural functions, religious or educational, and that private associations, such as political parties, political clubs, revolutionary societies, and private tribunals to achieve political or juridical ends, are among the most important voluntary organizations known. The socialists, therefore, are right in saying that the state could, if necessary and desired, carry on all social undertakings, and the individualists are right in saying that society could get on, and in a way achieve its ends, without the organized state; but both are wrong in supposing that either thing will happen under a normal social evolution. Whatever belittles the state or destroys popular faith in its power to perform successfully any kind of social service—whatever impairs the popular habit of achieving ends by private initiative and voluntary associations, by so much endangers society, checks its development, and prevents the full realization of its ends.

The supreme end of society is the protection and perfecting of sentient life. The end of human society is the evolution of the personality of its members. The associations directly concerned in this function are the cultural, namely: the religious, the scientific, the ethical and the æsthetic, the educational organizations, and what is called polite society. Economic, legal, and political organization exists (in a functional sense) for the sake of cultural organization and activity. Associations and relationships sanctioned by the social mind are known as institutions, and they are fostered or abolished always with a view to cultural as well as to protective ends.

Socrates.

Socrates (sŏk′rā̆-tēz), 470(?469)–399 B.C.; Greek philosopher; b. near Athens; the son of Sophroniscus, a sculptor, and was trained in his father's art. As a philosopher he called himself self-taught, and referred his knowledge sometimes to books, but more often to intercourse with distinguished men. Few events of his life are recorded. Of his wife Xanthippe, all that has passed into history is that she bore him three sons, that she had a violent temper, and that he said he married and endured her for self-discipline. He sought influence neither as a soldier (though he fought bravely at Potidæa, Delium, and Amphipolis) nor as a statesman, and once only discharged a political office. He proved himself to have an extraordinary capacity to endure cold, heat, and fatigue. He walked barefoot upon the ice and snow of Thrace in his usual clothing, while others were clad in furs. He was warned from participating in public affairs by what he called a *δαιμόνιον*—*i.e.*, an internal voice, which he professed to hear from childhood in the way of restraint, and which he was accustomed to speak of familiarly and to obey implicitly. By divinations, dreams, and oracular intimations also he believed his peculiar mission to be imposed upon him; and when the Pythian priestess pronounced him to be the wisest of men, he was perplexed between the decision of an authority which he deemed worthy of respect and his own estimate that he had no wisdom whatsoever on any subject.

With this sanction, he struck out the original path of an indiscriminate public talker for the sake of instruction, founding no school, teaching in no fixed place, and writing no books. His assumption of the character of an ignorant learner added zest to his discussions. He let slip no opportunity to engage with the masters of sophistry, to follow them through their subleties, to unravel their captious inquiries, and to wield the weapons of rhetorical adroitness in the interest of truth. Attached to none of the political parties, ridiculed in turn as a buffoon and as a moral corrupter, only a decent pretext was wanted to bring upon him the vengeance of power, and this was found in a charge of impiety and corruption of youth. Socrates had cross-examined with his dialectic skill and bitter irony most of the statesmen, orators, poets, sophists, and artisans of Athens. None had forgotten their humiliation at his hands; a few had sought help and instruction from him afterwards, but most of them avoided his presence and desired revenge. He approached his trial with no expectation of acquittal, though he had always obeyed the laws, and even in religious opinions was identified with the public mind of Athens. In his defense he declared his solicitude rather for the good of the Athenians than for himself; and he heard without surprise the sentence of condemnation, which was passed by a majority of only five or six in the Athenian dicastery of 567 members. He chose a cup of hemlock as the instrument of his death. He drank the cup with perfect composure after a conversation with his friends upon the immortality of the soul.

The Platonic dialogues of "Crito" and "Phædo" may be regarded as the substance of his last arguments on the duty of obedience to the laws and on the evidences of immortality. The "Memorabilia" of Xenophon and the dialogues of Plato have been supposed to represent an exoteric and an esoteric Socrates, and there has been a long controversy as to which contains the most complete and true accounts.

Socrates, with a turned-up nose, projecting eyes, bald head, thick lips, round belly, resembled a satyr of Silenus; he wore a miserable dress, and would frequently stand still in sudden fits of abstraction, rolling his eyes, staring on vacancy. The teaching of Socrates expresses the transition from the morality of custom and habit, mere conventional use and wont, to morality as conscious right conduct, resting on reflection and moral principles.

So′da, a hydrous oxide of sodium, Na_2O;, and the compound formed by the action of water upon this oxide, hydrate of soda, or sodium hydrate. The carbonates of sodium also are commercially called soda. Sodium hydrate, NaOH, or caustic soda, is prepared from the carbonate by the action of lime. Much caustic soda is made by heating or boiling together the Greenland mineral cryolite with hydrate of lime. The compound is white, opaque, crystalline, and melts below incandescence. It is used largely, in the form of solution or soda lye, for making soap.

Soda Ash, crude soda before having been refined. Previous to the French Revolution the only source of the alkali soda was from the ashes of seashore plants, or kelp. The trade in kelp ceasing during the revolution, the Committee of Public Safety called upon chemists to find some new source of soda, all the potash attainable being needed for gunpowder. Nicolas Leblanc, a surgeon and chemist, obtained the prize offered. His method consists in converting common salt into sulphate by sulphuric acid, and then heating this together with charcoal and carbonate of calcium, which gives, theoretically, a mixture of carbonate of sodium and sulphide of calcium. This process is carried on particularly in England, all the soda used for making soap, glass, and many other products being thus procured.

The defect of Leblanc's system as originally carried out was the loss of the sulphuric acid or of the sulphur used in making it. Hence other methods have been sought. One in successful operation, the Solvay or ammonia-soda process, consists of decomposing concentrated brine with a strong solution of bicarbonate of ammonia, which engenders chloride of ammonium and nearly insoluble bicarbonate of soda. The chloride of ammonium is reconvertible into bicarbonate, to be used over again. By Chance's process, patented in 1888, the sulphur can be economically recovered from the exhausted black ash in Leblanc's method.

Soda Wa'ter. See Aërated Waters.

So'dium, a metallic element first obtained in 1807 by H. Davy by the electrolysis of caustic soda (hydrate). Its occurrence in nature is chiefly as common salt (chloride of sodium) in the ocean, and as a constituent of silicates, chiefly the feldspars albite and oligoclase, on the land. It is also found in natron, an impure sodium sesquicarbonate, containing besides sodium sulphate and chloride. A cubic foot of ocean water contains about 6,440 grains (not far from 1 lb. avoirdupois) of metallic sodium, and a cubical tank 14 ft. on each side filled with sea water will contain more than one ton of this alkali metal. A cubic foot of rock salt contains over 52 lb. of sodium. Sodium is a metal probably more abundant in its occurrence than iron, and probably not necessarily much more difficult or expensive to obtain in approximate purity than the latter metal, and yet, by reason of the fewer uses developed for it, the cost of sodium is much greater than that of iron. Sodium is one of the elements most essential to animal life, being a constituent of all blood. It is also found in the vegetable organisms that dwell in the ocean and along its coasts, but plants dwelling on land above the sea level contain potassium more abundantly than sodium.

It may be prepared by distilling a mixture of charcoal and carbonate of sodium, the transformation being essentially

$$Na_2CO_3 + C_2 = 2Na + 3CO.$$

The sodium vapors are condensed and the metal collected under paraffin. When exposed to the air, it rapidly absorbs oxygen and moisture, forming either anhydrous oxide (Na_2O) or caustic soda ($NaOH$). When water touches it there is an intense reaction, with evolution of hydrogen gas and caustic soda. The heat produced may be so high that the metal takes fire, and burns with a yellow flame. Sodium must be kept immersed in some liquid which is free from oxygen, such as the heavy oils of coal tar.

The most important salts or compounds of soda are: *Acetate of Sodium.*—This is prepared on a large scale by the makers of wood vinegar or pyroligneous acid. It is used in medicine and as the source of commercial acetic acid by distilling with sulphuric acid. *Borates of Sodium.*—Of these the most important is borax. *Carbonates of Sodium.*—Of these there are two of importance—the neutral or normal carbonate, commercially sal soda or washing soda, and the bicarbonate, commercially cooking soda. *Sal soda,* $Na_2CO_3 + 10H_2O$, crystallizes in large, transparent crystals. This salt effloresces in the air very rapidly, falling down to a white powder, which contains but half as much water as before. It dissolves in twice its weight of cold water. The anhydrous carbonate is a product of enormous value in the arts, used chiefly in the making of glass and soap. *Cooking soda,* or *soda saleratus* (*disodium dihydrogen dicarbonate*), $HNaCO_3$, is made by exposing the last compound to an atmosphere of carbon dioxide, which is absorbed, with evolution of heat and separation of water. Commercial bicarbonate of soda is a white granular powder, which requires thirteen times its weight of water for solution. It is largely used in medicine and in cookery.

Sulphate of sodium, or Glauber's salt, $Na_2SO_4 + 10H_2O$, occurs native in mineral springs, and as the mineral species mirabilite. Glauber's salt is highly efflorescent, falling to a white powder in the air, and in time losing all its water of crystallization. It dissolves in three times its weight of cold and in its own weight of boiling water. It has a remarkable propensity to form supersaturated solutions. For *sulphite of sodium,* see Sulphurous Acid.

Sod'om, a city mentioned in the Old Testament memorable for its wickedness and its miraculous destruction by a storm of brimstone and fire (Gen. xix, 24, 25). The site of Sodom and its allied cities, Gomorrah, Admah, Zeboim, and Bela or Zoar, in the vale of Siddim, has long been discussed, the usual conclusion having been that the "cities of the plain" occupied the present basin of the S. bay of the Dead Sea. The catastrophe was perhaps not volcanic, but in consequence of the ignition by lightning of the asphalt with which the land is full, which would burn up the cities. The land sank when the asphalt had been burned out, and the Dead Sea overflowed the sunken ground. On the SW. coast of the Dead Sea is Jebel 'Usdom (hill of Sodom), a mass of mineral salt. At the S. end is a tall, isolated needle of rock, resembling a woman carrying a child. This is called Lot's wife. Josephus says that traces of the lost five cities could be seen under the waters. The catastrophe is mentioned by Strabo and Tacitus.

Sodom, Sea of. See Dead Sea.

Sofia (sō-fē'ä). See Sophia.

Sof'tas, at Constantinople the whole body of the theological students who receive instruction in the colleges (medressehs) connected with the larger mosques. From them are recruited the Mussulman clergy. Without ordination, but according to aptitude or length of study, each one is appointed to his special religious functions. This body of students has taken a prominent part in political affairs. Thus prior to the Russo-Turkish War (1877) they caused the deposition of an incapable grand vizier and of an obnoxious sheik-ul-Islam. Their number at the capital is probably not much below 10,000.

Sohrab'. See Rustam.

Soil. See Loam.

Solana'ceæ. See Nightshade Family.

So'lan Goose. See Gannet.

So'lar En'gine, or **Solar Mo'tor,** an apparatus for utilizing the heat of the sun as a motive power by causing it, through the medium of a reflecting metallic mirror, to heat the water in a boiler and convert it into steam.

Solar Par'allax, the difference of the directions in which the sun is seen from the surface and center of the earth. Attempts to estimate the distance of the sun were made by the ancient astronomers, Aristarchus and Ptolemy, but they were necessarily futile, since no observations they were able to make would measure so small a quantity as the parallax of the sun. Still they thought they measured the distance, and found it to be 1,210 radii of the earth. Telescopic observations showed that the sun's distance was far more than 1,200 radii of the earth. At the time of Newton all that was known of the solar parallax was that it must be immeasurable with the instruments then at command.

As the earth revolves around the sun, astronomers see other planets in various directions, and can thus determine the annual parallax of each. In this way the ratios between the different orbits admit of very exact observation. Without any knowledge of the actual distance of the sun, it can be said that if the distance of the earth be unity, then that of Venus will be 0.72333, that of Mars 1.52369, that of Jupiter 5.2028, etc. It follows from this that if any one of these distances can be determined, or even the distance of Venus or Mars from the earth at any moment, all the other distances will follow, including that of the earth from the sun. The nearer a planet comes to the earth the greater will be its parallax, and the more easily will its distance be determined. Moreover, observations on the position of a planet can be made with much more accuracy than on the sun.

It is now found that the most accurate measures of the parallax can probably be made on the small planets between Mars and Jupiter. There are other methods of determining the sun's distance. One of these is the measurement of the velocity of light. The phenomena of aberration show that there is a ratio between the velocity of light and the velocity of the earth in its orbit. This ratio is such that the velocity of light is a little more than 10,000 times that of the earth around the sun, and from this it follows that light takes about four hundred and ninety-eight seconds to pass from the sun to the earth. It follows that if it can be determined how many miles per second light travels, the distance of the sun can be at once obtained by multiplying this number by 498. This determination has actually been made with a high degree of precision.

Yet a third method of determining the sun's distance is founded on the theory of gravitation. The action of the sun in changing the motion of the moon around the earth will be slightly different, according to its distance. The difference is such that an inequality of about two minutes in the motion of the moon arises from this cause; but this inequality is difficult to determine. The value of the parallax is probably between 8.780" and 8.790". This gives, in round numbers, 93,000,000 m. for the distance of the sun, a result probably correct within 100,000 m.

Solar Sys'tem, the sun and the bodies which revolve around it. Its main features are the great mass of the central body, between 700 and 800 times the total mass of all the bodies which revolve around it; the orderly arrangement of the principal bodies of the system, which revolve around the sun in a fairly regular progression of distances, and in nearly circular orbits; and the isolation of the system from the other bodies of the universe, the nearest fixed star being about 9,000 times the distance of the farthest planet.

The bodies which compose the system are: (1) The great central body, the sun. (2) The four inner planets, Mercury, Venus, the Earth, and Mars. (3) A group of several hundred minor planets, or asteroids, revolving outside the orbit of Mars. Over 400 have been catalogued. (4) The four outer planets, Jupiter, Saturn, Uranus, and Neptune. These, with the four planets first named, are called *major planets.* (5) Twenty-one satellites revolving around the planets, of which one belongs to the earth, two to Mars, five to Jupiter, eight to Saturn, four to Uranus, and one to Neptune. Also a number of comets, which may be considered as belonging to the system; and clouds of meteoric particles, invisible in themselves, the presence of which is made evident by their combustion when they strike the atmosphere, forming shooting stars.

The principal features of the orbits of the major planets are their near approach to circles, and the fact that they lie nearly in the same plane. The most eccentric of their orbits is that of Mercury; yet the eye could scarcely distinguish its deviation from a circle, though it could perceive that the sun was not situated in the center of the circle. It is also the planet whose orbit is most inclined to the ecliptic, the inclination being seven degrees.

The principal elements of the planetary orbits are shown in the following table:

TABLE OF THE PLANETARY ELEMENTS.

PLANET.	Diameter in miles.	Mass (sun = 1).	Density (earth = 1).	Diurnal revolution.			Mean distance from sun.	Periodic time (days).
				h.	*m.*	*s.*	In millions of miles.	
Mercury	2,955	$\frac{1}{6000000}$	1.25	24	5	0	36	87.96926
Venus	7,610	$\frac{1}{408000}$	.875	23	21	24	67	224.700787
The Earth	7,912	$\frac{1}{333432}$	1.000	23	56	41	93	365.256358
Mars	4,210	$\frac{1}{3093500}$	.723	24	37.22	6	141	686.979714
								(Years.)
Jupiter	85,300	$\frac{1}{1047}$	.249	9	55	21	480	11.86197
Saturn	70,080	$\frac{1}{3501}$	.134	10	16		881	29.45694
Uranus	30,900	$\frac{1}{22600}$	.249	Unknown.			1,772	84.0205
Neptune	34,000	$\frac{1}{19700}$	.209	Unknown.			2,770	164.782

See SUN.

Solder (sŏd'ėr), an alloy employed to unite pieces of metal by fusion upon the proposed joint. There are many solders, each designed for some special use. Three grades of solder are in common use: common solder, of equal parts of tin and lead; fine solder, of two parts of tin to one of lead; and a cheaper article, of two of lead to one of tin. The soft solders are usually of lead and tin, or lead, tin, and bismuth; these melt at a low temperature. The hard solders cannot be melted at a low temperature; they are commonly of zinc and copper.

Sole, a flatfish of the *Soleidæ*. The common sole, *Solea solea*, is dark brown on its upper and white on its lower side, with the pectoral fin blackish at its end; it ranges between 10 and 20 in. in length, and between 1 and 10 lb. in weight, although the latter dimensions are rarely attained. It is found along the coast of Europe, and is highly esteemed; the flesh is white and firm. It is chiefly taken on the coasts of the British Islands by trawling. Another species is the lemon sole. *Achirus lineatus* is the nearest American ally of the European species; it is known as the hog choker, cover clip, or calico; it is worthless. In California several species of true *Pleuronectidæ* are called soles.

Solfeggio (sŏl-fād'jō). See SOLMIZATION.

Solferino (sŏl-fėr-ē'nō), village of Mantua, N. Italy; celebrated for the battle in which the French, under Napoleon III, and the Sardinians, under Victor Emmanuel, defeated the Austrians (June 24, 1859). It was the decisive battle of the war of Italian independence. The forces of the allies numbered about 150,000, while the Austrians brought about 170,000 into the field. After their defeat the latter retreated toward Verona, and left all Lombardy open to the allies. Napoleon concluded the truce of Villafranca.

Solic'itor, in Great Britain, an officer of the courts who is entitled to institute or defend any action, similar to attorneys in the U. S., except that the solicitors do not appear before the higher courts, that function being reserved for the barristers (*q.v.*).

Sol'idus, Roman gold coin, $\frac{1}{72}$ of the pound. In the Middle Ages a silver solidus, $\frac{1}{20}$ of the pound, was coined. This became the sol or sou, the latter being retained as the popular name for the five-centime piece.

So'lingen, town of Rhenish Prussia; 13 m. E. of Düsseldorf; famous since the Middle Ages for its iron and steel goods, especially sword blades, and still an important center for cutlery. Pop. (1900) 45,260.

Solis y Ribadeneyra (ē rē-vä-thā-nā'ē-rä), **Antonio de**, 1610–86; Spanish writer, first of poems and dramas; later as secretary to Philip IV and historiographer, wrote "Historia de la Conquista de Mexico," a Spanish classic, though shallow and bigoted, but the first connected history of the conquest.

Solitaire (sŏl-ĭ-târ'), the *Pezophaps solitaria*, a bird related to the dodo, formerly inhabiting the island of Rodriguez. Numerous remains of the solitaire have been found. It was larger than the turkey, and did not use its wings for flight. It was a slow runner, and defended itself with its wings and beak. Its flesh was good to eat. François Leguat, 1691, describes the solitaire in his "Voyages et Aventures."

SOLITAIRE, or PATIENCE, a game which one person can play alone; usually applied to games of cards in which the player arranges the cards according to some fixed rule and tries to classify them according to suits.

Solmiza'tion, or Solfeg'gio, in music, the art of giving to each of the seven notes of the scale its proper sound or relative pitch. The acquiring of a true intonation of the scale, first by regular gradation upward and downward, and then by skips from one degree to another, is of importance in vocal music. To facilitate this, expedients have been devised, chiefly the association of the several sounds with articulate utterances, such as the numeral words, *one, two, three*, etc. Many centuries ago certain syllables, void of any special meaning, but containing the several vowel sounds, were selected for this purpose, and are in general use.

Sol'omon (Hebrew, *Sh^{e}lōmōh*, "peaceable"), son and successor of David, King of Israel. His name was given with reference to the peace which should attend his reign (I Chron. xxii, 7–10). As the recipient of Jehovah's promise to the eternal line of David (II Sam. vii) he was also named Jedidiah, beloved of Jehovah (II Sam. xii, 24, 25). His mother was Bathsheba, the widow of Uriah. In I Chronicles xxiii, 1–xxix, 22a is an account of Solomon's being made king, followed (verses 22b–25) by an account of his being made king "a second time," this second account being a condensation of I Kings i. Apparently the first coronation occurred near the close of the fortieth year of David (his last year but one), and just before the outbreak of Absalom's rebellion (I Chron. xxvi, 31; II Sam. xv, 7), which interpretation gives a consistent meaning to the biblical data. —Solomon began his reign humbly and wisely, asking God for wisdom, which was granted. In his fourth year he began his great work, "the house of the Lord," for which David had laid plans and accumulated enormous treasures. It was completed and dedicated seven years later. This was but the beginning of his achievements as a builder. Among the structures attributed to him are his own palace, "the House of the Forest of Lebanon," and his wonderful throne, together with cities, fortifications, stations for commerce, reservoirs, and aqueducts. He also engaged in husbandry and in landscape gardening. He consolidated the kingdom which his father had conquered. He reorganized and enlarged the civil service of David. He started the hitherto pastoral or agricultural Hebrews on the new road of commerce, sending ships to "Ophir," India, and Arabia in the East from Ezion-geber on the Red Sea, and from Jaffa and Tyre, to "Tarshish" in Spain. Many kings were his tributaries; untold wealth and the wonders and curiosities of many countries flowed into the land. Many foreigners were attracted by his splendor and wisdom, notably the Queen of Sheba, with her retinue. His harem had 1,000 inmates, in accordance with Oriental ideas of magnificence.

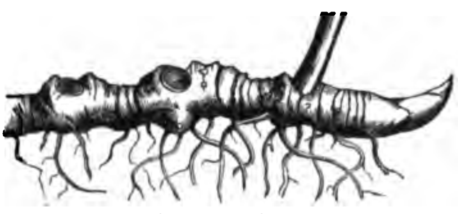
In Jewish and Mohammedan tradition he appears as a person of fascinating beauty and grace, impetuous, generous, sympathetic, and at first humble; of fine humor and noble intellect, a man of broad views, a far-sighted statesman, learned in the science of the day. He was an organizer of splendid executive powers, a great builder and artist, poet, philosopher, and had from the Lord preëminently "an understanding heart to judge." Unfortunately, there is another side to the picture. From motives of state Solomon married the daughter of Pharaoh of Egypt and many other wives from among the princesses of his tributary kingdoms. This led to latitudinarianism in religion, to extravagance, to oppression and disregard of human rights. The result was that his reign was partly a failure. Before his death Edom and Syria revolted, and Jeroboam raised rebellion. After his death the ten tribes revolted, so that the strictly Israelite portion of his kingdom was divided, while the tributary peoples fell away from their allegiance.

Solomon, Song of. See CANTICLE.

Solomon Ben I'saac, generally known as RASHI (a combination of the initial letters of his title and name), 1040–1105; celebrated Jewish commentator; b. Troyes, France. Little is known about his life, except that he studied at the theological schools of Mayence and Worms. He died July 13, 1105. He wrote commentaries on all the books of the Bible except Chronicles; which, though they contain much of the traditional rabbinic exegesis, seek to determine the simple meaning (*Peshat*) of the text. They have been held in the highest esteem not only by Jewish writers, but also by Nicolaus de Lyra, Luther, Sebastian Münster, etc. His commentary on the Pentateuch was the first Hebrew book printed (1475). He also wrote a commentary on twenty-three of the treatises of the Babylonian Talmud, which is printed in every edition of that work. Among his other writings may be mentioned a commentary to *Bereshith Rabba*; *Happardes*, containing decisions on ritual and legal matters; and a few hymns. In his commentaries Rashi cites a large number of Provençal words which have been collected by Arsène Darmesteter, and which are of value in determining the pronunciation of the particular dialect used by the Jews in that part of Provence.

Solomon (German, SALOMON) **Is'lands,** an archipelago E. of New Guinea, from which it is separated by the Bismarck Archipelago and Louisiade Islands. It consists of seven large islands and many small ones. The N. half of the archipelago was taken under German protection in 1886. The largest of the islands are Bougainville (pop. 10,000), Choiseul (5,850), and Isabel (5,840). The total area of the islands is 16,950 sq. m.; pop. 89,000. The remainder of the archipelago was brought within the British protectorate, June, 1893. In 1899 Germany ceded Choiseul and San Isabel to Great Britain, which now controls the remainder of the group with the exception of Bougainville and Buka, which still belong to Germany. The inhabitants are Papuan and Polynesian. They are intelligent, quick, and crafty, but make good servants, and are in demand as laborers. They are cannibals; their weapons consist of the bow and arrow, spear, and club, which are of fine finish. Their canoes are the finest in the Pacific. The islands are volcanic, surrounded by coral reefs. They were discovered in the sixteenth century, but were lost sight of until 1767, when they were rediscovered by Carteret. They are still the least-known group of the Pacific.

Solomon's Seal, any one of the liliaceous herbs of the genera *Polygonatum*, *Vagnera*, and *Unifolium*, found in Europe and N. America. The name properly belongs only to the species of *Polygonatum*; the "seal" is the circular depressed scar left on the root stock by the separation annually of the flowering stem. The common Solomon's seal, *P. multiflorum*, is found in England and Scotland. It has a stem 2 ft. high. The flower stalks are generally unbranched; the flowers, which are not large, are white and drooping.



SOLOMON'S SEAL.

Rhizome, showing stem, bud, and scars of former stems.

Solomon's Tem'ple. See JERUSALEM.

So'lon, abt. 638–559 B.C.; Athenian lawgiver of royal descent, but impoverished by his father's extravagance; he visited in his youth many parts of Greece and Asia as a merchant, gained distinction by his poems, and from his reputation for political wisdom was reckoned one of the seven sages. He began his political career by recovering Salamis from the Megarians, and gave to Athens the mastery of the sea. The repeated failure to capture Salamis had so discouraged the Athenians that a law was passed prescribing death for anyone who should renew the attempt. The Athenians were captives in their own land. Solon, feigning madness, roused the patriotic ardor of his countrymen by his poems, and then led them to victory. It was the turning point in the history of Athens. In 594 he was called to the archonship, with authority to confirm, repeal, or modify the Draconian laws. The constitution of Solon was by a solemn oath declared valid without alteration for ten years. He obtained leave of absence for that period, and visited Egypt and Cyprus. He returned to Athens prior to the first usurpation of his relative Pisistratus (560), and amid violent dissensions was respected by all parties.

The radical evil which Solon had to cure was that the small landowners were hopelessly in debt. The debtors' laws were mollified; limits were set to the acquisition of large estates, and a modification of the coinage alleviated the wretched condition of the proletariat. The government was no longer conducted by a few noble families, but shared in by all in proportion to their property. Sumptuary regulations repressed extravagance; and the statutes, written on wood, were exposed to be read by all. Crœsus, the magnificent King of Lydia, seeking a compliment, asked Solon, "Who is the happiest man you have ever seen?" and was mortified by the philosopher's reply: "I can speak of no one as happy until I have seen how his life has ended."

Solor', an island of Malay, off the E. extremity of Flores; area, 105 sq. m.; pop. 15,000, mostly engaged in fishing and trading. Sulphur and edible birds' nests are the principal articles of exportation. Also the small archipelago to which this island belongs. It contains two other larger islands—Adenara and Lomblem. Area of the group about 1,250 sq. m.; pop. est. from 40,000 to 180,000.

Sol'stice, the inclination of the earth's equator to the ecliptic or plane of its annual motion about the sun is the cause that the latter is during half the year on the N. polar side of the equator, the other half on the S., causing the vicissitudes of summer and winter to the respective hemispheres. The distance from the sun N. or S. of the equator is thus constantly varying. The two points at which this apparent N. or S. motion ceases (or at which its progressive increase of declination appears to be arrested) are the summer and winter solstices. At these periods the day is the longest or shortest, according as the earth is in the summer (June 21st) or winter (December 21st) solstice. See EQUINOX.

Sol'uble Glass, or **Wa'ter Glass,** an artificial silicate of soda or potash, or a double silicate of these alkalies. It may be formed by fusing eight parts of dry carbonate of soda or potash with fifteen parts of white sand. Soluble glass is applied to brick and stone walls to harden them, in fireproofing, and as a fixative in dyeing.

Solu'tion, the liquid product formed when a solid, a liquid, or a gas dissolves in a liquid. Thus when water is poured upon salt or sugar the solid substance disappears as such and passes into the liquid form. Any liquid which has the power to dissolve a substance is called a solvent, and the substance is said to be soluble in the liquid. Water is used more commonly than any other liquid, while alcohol is also much used, especially for medicinal solutions. Tinctures are such alcoholic solutions of medicinal constituents of plants. Some liquids mix with one another, or, in other words, they dissolve one in the other, as water and alcohol. Other liquids act differently. Thus water, as is well known, does not dissolve oily liquids. Ether and benzine, on the other hand, do dissolve oils. Some gases dissolve in water to a very remarkable extent. Thus water can dissolve 1,000 times its bulk of the gas ammonia. Water also dissolves carbonic-acid gas, and all natural waters contain some of this gas in solution. When a liquid is placed in a closed vessel, and gas forced into it, it dissolves more and more gas as the pressure increases; and when the pressure is removed, the gas passes rapidly out of solution, giving rise to effervescence, as is commonly seen in soda water.

In a solution, whether of a solid, a liquid, or a gas, the dissolved substance is uniformly distributed—there is as much of it in one drop of the solution as there is in any other drop. A drop of a concentrated solution of magenta brought into many gallons of water imparts a distinct color to all parts of the liquid. This gives some idea of the extent to which the division of matter can be carried, for in each drop of the dilute solution there must be contained some of the dye, though the quantity must be infinitesimally small. Little is positively known in regard to the nature of solution. There are facts that indicate that the particles of the solvent form unstable compounds with the particles of the dissolved substance. In some cases it appears that solution involves a complete breaking down of the dissolved substance.

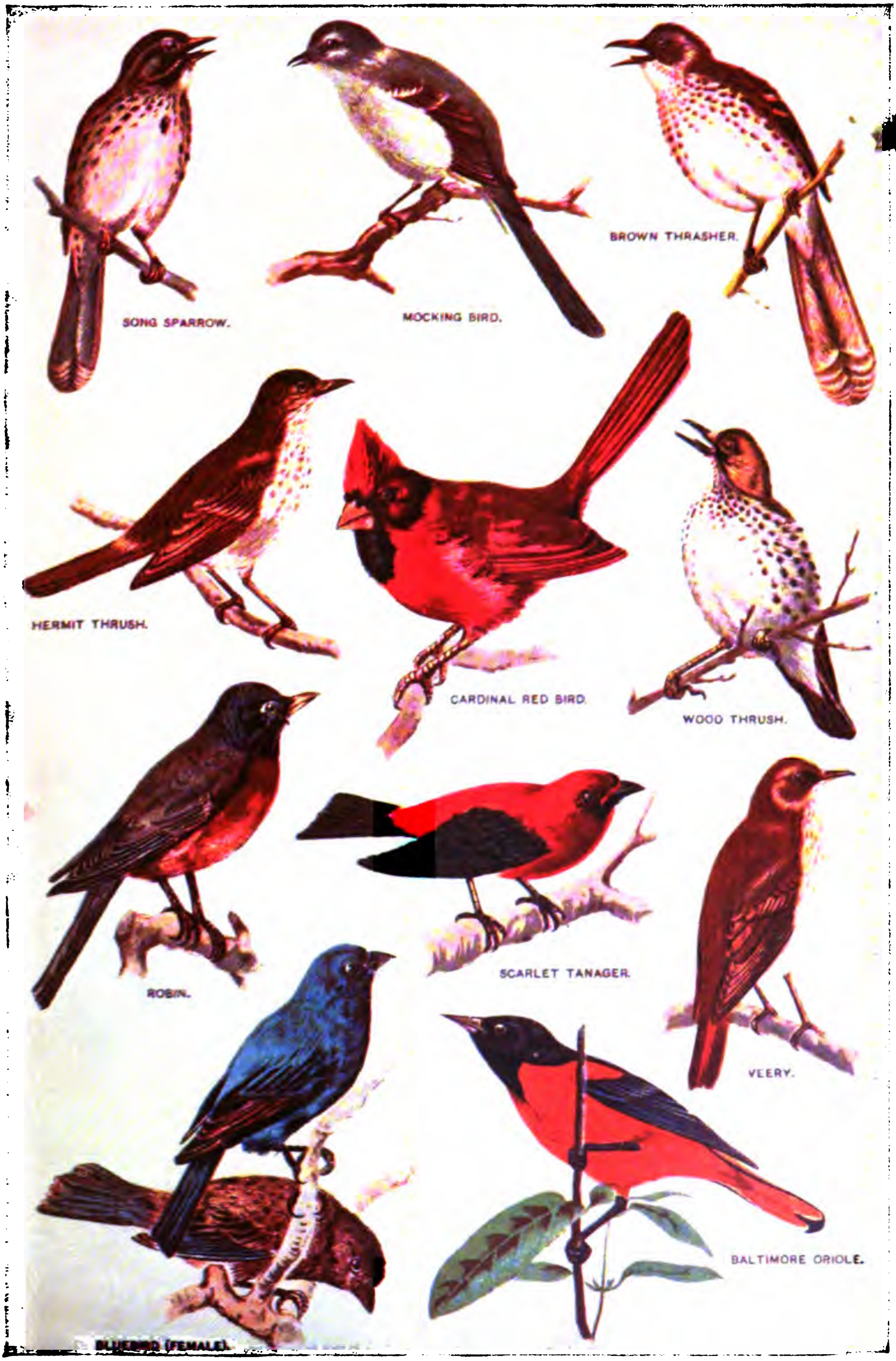
Sol'way Firth, an inlet of the Irish Sea, 33 m. long, from 2½ to 20 m. broad; it separates Cumberland from the S. of Scotland. It is noted for the swiftness and strength of its ebb and flow, the spring tide rushing in with a wave from 3 to 6 ft. high, and with a speed of from 8 to 10 m. an hour. It receives the Esk, the Derwent, and several minor streams.

Sol'yman, same as SULEIMAN (*q.v.*).

Soma'li Coast, or **Somali Land,** an ill-defined area occupying the E. horn of Africa, and extending along the Gulf of Aden and the Indian Ocean from Zeila, in lat. 11° 18′ N., to the mouth of the Jub, in lat. 0° 14′ N.; claimed by the British (along the Gulf of Aden) and the Italians (along the Indian Ocean S. to British E. Africa); the remainder subject to Abyssinia; area of the former part about 68,000 sq. m. The British and Italian governments in 1894 defined the limits of their protectorates. It is mountainous, rich in myrrh and incense, and inhabited by tribes related to the Abyssinians, Mohammedans, and Gallas, and mostly nomads and ill famed from their predatory habits. The principal port is Berbera. During the hot season it is deserted, but in winter comprises a population of about 30,000 people, who gather to exchange the products of their industry. The French Somali Coast Protectorate is on the Gulf of Aden; capital, Jibuti.

Somatol'ogy, the science of living organized bodies as far as relates to material conformation and not to psychological phenomena. The name has also been given to the study of inorganic bodies, in which case it does not differ much in signification from physics.

Som'ers, John (Lord), 1651-1716; English statesman; b. Worcester; was chairman of the committee which drew up the Declaration of Right; in 1697 was Lord Chancellor. He drew up the plan for the union of the crowns of


SONG SPARROW.
MOCKING BIRD.
BROWN THRASHER.
HERMIT THRUSH.
CARDINAL RED BIRD.
WOOD THRUSH.
ROBIN.
SCARLET TANAGER.
VEERY.
BALTIMORE ORIOLE.
BLUEBIRD (FEMALE).

SONG BIRDS.

England and Scotland, 1706. A valuable collection of state papers, known as the "Somers Tracts," was edited from originals in his library.

Som'erset, Edward Seymour (Duke of), 1500–52; English statesman; brother of Jane Seymour, mother of Edward VI. After the death of Henry VIII he rose to the head of affairs, becoming king in all but name. When the Scots opposed the marriage of Mary Stuart to Edward VI, Somerset defeated them in the battle of Pinkie. His arrogance and rashness provoked opposition, and among his political adversaries was his own brother, Sir Thomas Seymour, who was executed by his orders, March, 1549. This brought the protector into great odium, and in October, 1549, the young king had him thrown into the Tower, but he was released in a few months. Among his rivals was the Earl of Warwick. Somerset plotted against his life; was again arrested, found guilty of felony and constructive treason, and beheaded.

Somerset House, a building in London between the Strand and the Thames erected in the eighteenth century, and now occupied by King's College, as well as several government branches, as the inland revenue and the registrar's office. It is also the depositary of wills.

Som'ersetshire, county of SW. England; area, 1,615 sq. m. The surface is diversified by low, rocky hills; the Mendip Hills in the N. and the Quantock Hills in the W. Coal and freestone are mined, and iron and lead in small quantities. Large tracts afford excellent pasturage. Cheddar cheese and cider are largely produced. Dairy farming is one of the principal occupations; leather, glass, paper, and iron goods are made. Pop. (1901) 385,059.

So'mers's Is'lands. See BERMUDA ISLANDS.

Somerville, city; Middlesex Co., Mass.; on the Mystic River; till 1842 a part of Charlestown, and is a residential city for many engaged in business in Boston. In 1900 there were 378 factories (representing 71 industries), with a combined capital of $10,131,596, and turning out products valued at $21,776,511. The city was settled in 1629, and incorporated 1872. It is built on seven hills. The first vessel built in the state was launched from Gov. Winthrop's Ten Hill farm on the Mystic River in 1631; a powder house erected on Quarry Hill abt. 1703 is preserved in the center of a public park; the strongest fortifications in the vicinity were built on Winter Hill during the siege of Boston; Gen. Putnam's "impregnable fortress" was on Cobble Hill; and the "citadel," where Washington raised the first colonial union flag, January 1, 1776, was on Prospect Hill. Pop. (1905) 69,272.

Somme (sōmm), department of N. France, bordering on the English Channel; area, 2,443 sq. m. The surface is flat, but the soil fertile, and large crops are raised. Cattle breeding is extensively carried on, and the manufactures of velvet, silk, cotton goods, soap, chemicals, beet-root sugar, paper, and linen are important. Pop. (1906) 532,567.

SOMME is also the name of a river of France; rises in the department of Aisne, passes by St. Quentin, Ham, Amiens, and Abbeville, and falls into the English Channel after a course of 152 m. It is navigable to Amiens, and is connected with the Seine, Oise, and Scheldt by canals.

Somnam'bulism. See SLEEP.

Sona'ta, originally, in the sixteenth century, any composition for instruments, in contradistinction to vocal compositions, or *cantata.* Later, especially after Bach, the name was applied principally to compositions for solo instruments and of a certain form, consisting of several movements—first, three, the *allegro, adagio,* and *rondo*—to which afterwards a fourth was added by Haydn, the *minuetto* or *scherzo,* which differed from each other in time and sentiment, but were held together by the general character pervading all. This form of composition was greatly developed by Haydn and Mozart, and culminated in Beethoven.

Song-koi', the largest river of E. Indo-China, and a trade route of importance. During floods the waters are reddened; hence the French name Rouge; length about 750 m.

Song of Birds, the musical notes uttered by many birds, especially by oscine passerines. Nearly all birds utter some kind of a cry, but in the majority it can scarcely be called a song. In man and other mammals sounds are produced in the larynx, but in birds musical sounds are produced in an enlargement of the windpipe, termed the syrinx, just above the forks of the bronchi. To the syrinx are attached the singing muscles, numbering in the oscines from four to six or eight pairs. The apparatus is simple, and its modifications are slight. There is no reason to suppose that the tongue takes any important part in the production of sounds even in birds which pronounce words. Song is almost exclusively an attribute of male birds, although the female may sing, as does the cardinal of the U. S., and it is heard most often during the time of pairing, so that spring time is preëminently the season of song; still some birds sing throughout the year, and even, like the Carolina wren, in winter. The bobolink changes his manners with his coat, and sings only in full-dress plumage. Early morning is the favorite hour for song; next to that the sunset hour, but some birds, like the scarlet tanager, sing during the torrid heat of a S. noonday, and many songsters besides the nightingale sing at night, notably the mocking bird and yellow-breasted chat of the U. S. The gay-plumaged birds of the tropics belong largely to the harsh-voiced *Clamatores,* but a bright coat is not a sure sign of a discordant voice. Not only do individuals of a given species vary considerably in their power of song, but certain localities seem to develop musical talent better than others. The meadow lark sings better in Florida than in the N. parts of the U. S., while the W. subspecies excels that of the E.

Song of Songs. See CANTICLE.

Son'net, a poetical form which, as finally perfected by the Italian poets, Fra Guittone, Dante, and Petrarch, in the thirteenth and fourteenth centuries, consists of fourteen hendecasyllabic verses (corresponding to English decasyllables), arranged according to a rigid scheme. The main features of this are the division of the sonnet into two parts, the first of eight lines (called the octave), the second of six (called the sestet); the further division of the octave into two tetrastiches (called in Italian *piedi*); the employment of but two rhymes in the octave, arranged *a b b a a b b a*; the use of either two or three rhymes in the sestet variously arranged, though *a b b a b a* is preferred. The sestet, when it forms an indivisible whole, is often called in Italian *sirima*; when it falls into two tercets, *volte*. This severe form, however, has not been followed by all sonnet writers. Shakespeare hardly observes the minor divisions of the sonnet at all. He arranges the rhymes of the octave *a b a b a b a b*, or even *a b a b c d c d*, thus neglecting all the subtle modulations of the Petrarchan type. He often allows the sense to run over from the octave to the sestet; and even when he parts the two he makes little effort to contrast the meaning and the harmony of the latter with those of the former. This loose type of the sonnet is often called the bastard or illegitimate sonnet; but this is hardly justified by the history of the form.

Wordsworth's sonnet on the sonnet does more than exemplify its form:

> Scorn not the Sonnet, Critic, you have frowned,
> Mindless of its just honours; with this key
> Shakespeare unlocked his heart; the melody
> Of this small lute gave ease to Petrarch's wound;
>
> A thousand times this pipe did Tasso sound;
> With it Camoens soothed an exile's grief;
> The Sonnet glittered a gay myrtle leaf
> Amid the cypress with which Dante crowned
>
> His visionary brow; a glow-worm lamp,
> It cheered mild Spenser, called from Faery-lands
> To struggle through dark ways; and, when a damp
>
> Fell round the path of Milton, in his hand
> The Thing became a trumpet, whence he blew
> Soul-animating strains—alas, too few!

Sono'ra, NW. state of Mexico; area, 76,900 sq. m. The Sierra Madre Range forms the E. boundary, and its spurs cover much of the E. part, which is imperfectly known. Succeeding this region are plateaus and valleys with a rich soil, but only available for agriculture by irrigation. The lands along the coast are arid, except in the river valleys. The NW. part is a desert, resembling Arizona. Of the few rivers the Yaqui is the most important. The climate is hot on the lowlands, mild on the plateaus and in the higher valleys; rains (principally from July to September) are scanty, and the NW. deserts and parts of the coast belt are essentially rainless. There is no true forest, except in the mountains. The state is rich in minerals; the mines of silver and gold are famous, lead occurs with silver, and coal beds have been opened in the Yaqui valley, the product being exported to Arizona. Mining is the only important industry; cereals, etc., are cultivated in the river valleys, and there are herds of cattle in the N. A kind of guano is found on islands in the Gulf of California. Pop. (1900) 221,682. A large proportion are Indians of the Opata, Pima, and other tribes, who retain their old customs and languages, and are often practically independent.

Soochow', formerly Soo-chow Foo, or Suchow, a city of China, capital of a department of same name, and of the province of Kiangsu; on the Grand Canal, 80 m. W. of Shanghai. In 1861 the Taipings reduced the city almost to ruins, the only buildings which escaped destruction being the temples (300 in number) and pagodas, one of them, the Great Pagoda, being the highest in China. Soochow is a great commercial and manufacturing city, thousands of looms turning out silk and satin, and there are numerous workers in wood, iron, brass, tin, stone, silver, and gold. Its streets —7 or 8 ft. wide—are too narrow for traffic, but a network of canals extends throughout the city and surrounding region, and along these the heavy traffic passes. Pop. 500,000. A history of Soochow in 150 volumes was written one thousand years ago. September 26, 1896, Soochow was opened to foreign trade.

Soot, a carbonaceous deposit from smoke, formed in chimneys. That which forms nearest the fire is often shining and varnishlike, consisting chiefly of dried tarry matters mixed with carbon, and giving a brownish-black powder, sometimes used as a pigment under the name of bistre. That which forms farther up the chimney is more like lampblack.

Soo'ty Tern. See Egg-bird.

Sophi'a, capital of Bulgaria; on a tributary of the Iskra. Till 1878 it was "a dirty and pestilential village of wooden huts," but since Russia wrested from the Ottomans a semi-independence for Bulgaria (1878), it has improved. It now resembles a European city with straight, clean streets and attractive houses. Over 7,000 Ottomans from among its former residents emigrated, but the population has steadily increased. It has manufactures of leather, earthenware, and woolen cloth, and an active transit trade. Pop. (1905) 82,621.

Sophia, St., Church of, in Constantinople, the most celebrated ecclesiastical edifice of the Greek Church, now used as a mosque, was built by the emperor Justinian, and dedicated in 558. It is in the Byzantine style of architecture, has a fine dome rising to the height of 180 ft., and is richly decorated in the interior. With the principal dome are connected two half domes and six smaller ones, which add to the general effect. The mass of the edifice is of brick, but is overlaid with marble; the floor is of mosaic work, composed of porphyry and verd antique. The great piers which support the dome consist of square blocks of stone bound with hoops of iron. The numerous pillars supporting the internal galleries are of white and colored marbles, porphyry, granite, and have capitals of various peculiar forms. The interior of the church is 243 ft. in width from N. to S., and 269 in length from E. to W., and its general effect is singularly fine.

Soph'ists, the seven wise men of Greece, but, later, the teachers at Athens who gave lessons in the arts and sciences for money. Truth being many sided, the point of view taken was supposed to justify differences of opinion, and the art of presenting grounds or reasons to justify any view is the art of the Sophists, or sophistry.

Sophocles (sŏf'ŏ-klēz), 496 or 495–405 B.C.; tragic poet of Greece; b. of a wealthy family at Colonus, near Athens. He was carefully trained in gymnastics and music. At sixteen he led the chorus of boys in honor of the victory of Salamis, and there is other evidence of his personal beauty and grace. His first play, acted in 468, was a great success, and won the prize over Æschylus after a close contest. For the next ten years Sophocles divided with Æschylus the empire of the stage. After the death of Æschylus, Sophocles was the leading dramatist. He never failed of at least the second prize, and coped successfully with such plays as the "Alcestis" and the "Medea" of Euripides. But as Æschylus accepted the improvements of Sophocles, so Sophocles in his later plays was clearly influenced by Euripides, whose greatness he did not fail to recognize. Sophocles took an active part in public life, and was called to hold high positions. In consequence of the sentiments expressed in his "Antigone" (440) he was made a colleague of Pericles in the command of the forces sent against Samos. Before that he had been an Hellenotamias or treasurer of the Alliance, and in the troublous times of the Peloponnesian War he is said to have been one of the *πρόβουλοι*, or committee of safety. Love played a large part in his life, and his sweet and easy temper was often put to the test. According to tradition, when far advanced in years Sophocles was brought before a family court by his son Iophon on the charge of disordered intellect. The aged poet recited the famous encomium on Colonus from the "Œdipus Coloneus," which he had just composed, and the charge was dismissed—as the story may be. He died an easy death in 405.

Of his 123 dramas seven are extant—"Ajax," "Electra," "Œdipus Tyrannus," "Antigone," "Trachiniæ," "Philoctetes," "Œdipus Coloneus." In the construction of the plot Sophocles had no rival. His "Œdipus Tyrannus," to cite but one instance, is a tragic web of unequaled sublety and effectiveness. The lyric parts of his plays are in beautiful balance with the dramatic element. His language is more supple than that of Æschylus, but never falls short of elevation. It is sweet, and yet does not lack a certain austerity that saves it from cloying.

Sopra'no, the highest voice of women and boys. The compass of the high soprano extends from lower E on the treble staff to C above, and that of the mezzo-soprano from A below to A above. Among the high sopranos exceptional compass is sometimes found, reaching even to F and G in alt.

Sorac'te, the present MONTE DI SAN ORESTE, a mountain of Etruria, an outlying offset of the Apennines, from which it is detached by the valley of the Tiber. It rises abruptly 2,420 ft. above the plain, and forms a picturesque feature in the views of the Campagna. In ancient times it was dedicated to Apollo, and bore on its top a celebrated temple to which peculiarly solemn processions were made from Rome. In 746, Carloman, the brother of Pepin, founded the monastery of San Silvestro on the site of the old temple. Its present name is derived from a village, San Oreste, on its slope and known for its sour wine.

Sora'ta. See ILLAMPU.

Sorbonne (sŏr-bŏn'), the theological faculty of the ancient Univ. of Paris; named from Robert de Sorbon (b. at Sorbon, Ardennes, 1201, chaplain to Louis IX; died renowned for sanctity and eloquence, 1274). In 1252 he founded an institution connected with the Univ. of Paris, in which seven secular priests were to teach theology to sixteen poor students, and, 1253, the institution received its charter from Louis IX, which was confirmed, 1268, by Pope Clement IV. Connected with it was a preparatory school. Both were under a provisor. The severity of the examinations made its degrees of high esteem. During the Middle Ages, and even after that time, the decisions of the Sorbonne were appealed to not only in theological controversies, but also in the contests between the popes and the secular powers. It demanded the condemnation of Joan of Arc; it justified the massacre of St. Bartholomew; it sided with the League, and condemned both Henry III and Henry of Navarre. On the other hand, it introduced printing into Paris immediately after its invention, and prevented the introduction of the Peter's Pence and the Inquisition into France. It was a stanch champion of the freedom of the Gallican Church, and strongly opposed to Ultramontanism. Its culmination was in the time of Richelieu, who, himself a graduate of the school, provided it with a magnificent building and enlarged its library (1629). In its contest with the philosophy of the eighteenth century it was unsuccessful, and it had outlived its fame when during the revolution it was suppressed (1790). At the reconstruction of the university in 1808, the building, called the Sorbonne, became the seat of the *académie,* and between 1816 and 1827 was given to the theological faculty in connection with the faculties of science and *belles-lettres.* New buildings were erected, 1884–89, at an expense of nearly $4,500,000. The Sorbonne has now over 100 professors and 10,000 students.

Sorb Tree, or **Wild Serv'ice,** the *Pyrus terminalis,* a small European tree (family *Rosaceæ*), the wood of which is hard and valuable. Its fruit, the sorb, when overripened, is soft and mellow and good eating. Hertfordshire, England, is famous for its sorbs. The name is sometimes applied to *P. domestica.*

Sor'cery. See MAGIC.

Sordel'lo, abt. 1180–abt. 1255; Italian poet and warrior; b. Goito, of noble Mantuan family; wrote, in Provençal, love songs and political poems; eloped with Cunizza, wife of Count Richard of St. Boniface. Died a violent death.

Sorel′, Agnes. See Agnes Sorel.

Sor′ghum, a tall, broad-leaved annual plant of the grass family, regarded as a variety (*Saccharatum*) of *Andropogon sorghum.* Its original home was doubtless the interior of Africa, but modern travelers do not report its having been found there in a wild state, and the wild forms, as in the case of the sugar cane, appear to have been lost. Sorghum as a cultivated plant has been known from antiquity. It was introduced into Italy at the beginning of the Roman Empire, but its culture did not flourish. Experiments were again conducted with it at Florence in 1766, but with no practical results. In China it has been cultivated from the earliest historical times, but only as a cereal and for fuel and forage until recently. During the Civil War sorghum was cultivated owing to the high price of sugar.

Chinese Sugar Cane.

The difficulties attending the making of sugar from sorghum depend on the presence of bodies such as starch, gum, noncrystallizable sugar, etc., which tend to prevent crystallization. Sorghum produces seeds which are equal to ordinary cereals for food; each ton will yield 100 to 150 lb. of seed. It is valuable as forage, for which purpose it is chiefly cultivated, although, in a small way, it is used for making molasses.

Soric′idæ, family of mammals of the *Insectivora,* including shrews or shrew mice. Externally they resemble mice, but are distinguishable by the longer and pointed snout.

Sor′rel, sour-leaved plants of the genus *Rumex* (*Polygonaceæ*), to which genus the coarse herbs called dock also belong. The common sorrel of sterile fields is *R. acetosella.* Plants of the genus *Oxyria* are called mountain sorrels. The wood sorrels are of the genus *Oxalis* (*Geraniaceæ*). In Europe the sorrels, mountain sorrels, and wood sorrels are cultivated in gardens for table use. All these owe their sourness to oxalic acid and its salts.

Common Sorrel.

Sorrel Tree, or **Sour′wood,** the *Oxydendrum arboreum,* a handsome tree of the U. S., found in Ohio and Pennsylvania and southward to the Gulf. Its leaves resemble those of the peach. They are sour, and from them a cooling drink is made for the sick. The wood is soft and difficult to dry. It is sometimes planted as an ornamental tree.

Sorren′to (ancient, *Surrentum*), town; province of Naples, Italy; on a small rocky peninsula S. of the Bay of Naples. It was a Greek settlement, was adorned with splendid temples, and after the fall of the W. empire was ruled by its own consuls and dukes. Of the old temples, a few fragments alone remain. The salubrious climate, the luxuriance of the vegetation, and the beauty of the scenery have made Sorrento one of the most frequented resorts in S. Italy. It is the birthplace of Torquato Tasso. Pop. (1901) 6,969.

So′ter. See Ptolemy.

Soterol′ogy, that branch of Christian theology which treats of the redemptive work of Christ. In its wider signification the term includes both the atonement which Christ made and its application through faith to individuals. It is, however, used in a more restricted signification, to denote only the atonement. See Atonement.

So′thic Pe′riod, a period of 1,460 Julian years (365¼ days), equal to 1,461 vague years (of 365 days) of the Egyptian calendar. In the latter the year was reckoned by twelve months of thirty days, with the addition of five intercalary days. The difference between the two thus amounted to about six hours annually, so that the vague year receded about one day in each four years. The beginning of a Sothic period was marked by the coincidence of the heliac rising of Sirius with the calendar new year, and at the rate of divergence between the two systems this coincidence recurred once in about 4 × 365 = 1,460 solar years. In the course of a Sothic period any periodic event, such as the inundation of the Nile or the rising of the dog star, fell upon each and every day of the civil calendar. The difference in the appearance of such periodic events was not marked in the life of an individual, being only about twenty-five days in a century. Consequently little attention was paid to the matter till in the Ptolemaic dynasty, when the Sothic period seems first to have been used in calculating time. Reckoning back, by Sothic periods, beginning approximately 1322 B.C., 2782 B.C., and 4242 B.C., the beginning of the first dynasty has been assigned to the year 4777 B.C.

So'this, another name for SIRENS (*q.v.*).

Soto (sō'tō), **Fernando,** or **Hernando de,** 1496–1542; Spanish explorer. After studying at one of the universities, he accompanied in 1519 his patron, Pedrarias Dávila, on his second expedition to America as Governor of Darien. He supported Hernandez in Nicaragua in 1527, and in 1528 explored the coast of Guatemala and Yucatan. In 1532 De Soto joined Pizarro in his enterprise for conquering Peru. In 1533 he penetrated through the mountains, and discovered the great national road which led to the Peruvian capital, and was soon after selected by Pizarro to visit the inca Atahuallpa as ambassador. He was prominent in the engagements which completed the conquest of Peru, and was the hero of the battle which resulted in the capture of Cuzco. He returned to Spain with a large fortune. Having obtained permission to make the conquest of Florida at his own expense, De Soto sailed in 1538 with more than 600 men, and reached Florida in 1539. He sent back his ships to Havana, set out upon a journey to the NW., and reached the Mississippi in 1541, after losing many of his followers. He crossed the river, went N. to Pacaha, and thence to the White River, the W. limit of his expedition. Then proceeding S., he wintered at Autiamque on the Washita River. While descending the Mississippi in 1542 he died of fever, and to conceal his death from the hostile savages his body was sunk at midnight in the middle of the stream. His followers, reduced in number more than half, then went to Mexico. Soto is properly regarded as the true discoverer of the Mississippi, though Pineda found its mouth in 1519, and Cabeza de Vaca must have crossed it near the Gulf in 1528.

Soudan'. See SUDAN.

Soul, a term variously used to signify either the principle of life in an organic body, or the first and most undeveloped stages of individualized spiritual being, or, finally, all stages of spiritual individuality, incorporeal as well as corporeal. Aristotle, whose treatise, "De Anima," is the first and perhaps the greatest work on the subject, has himself introduced this confusion by defining the soul in one instance as the self-determining power of an organized body, and then afterwards attributing to it reason, and making it as reason entirely separable from body. The much-debated question of the immortality of the soul implies a definition of soul as including not only its phases of corporeal existence, but also the higher ones of thought and will. See FUTURE STATE; IMMORTALITY; RESURRECTION.

Soult (sōlt), **Nicolas Jean de Dieu,** Duke of Dalmatia, 1769–1851; French military officer; b. St. Amans-la-Bastide, France. In 1793-94 he rose from captain to brigadier general, and in 1799 was made general of division for his share in the battle of Zurich, which saved France from invasion. He was captured by the Austrians at Genoa, May 15, 1800, but was exchanged after Marengo. In 1804 Napoleon made him a marshal, and at Austerlitz declared him to be the first strategist of Europe. In 1806–7 he won fame in the Prussian campaign, after which he was made Governor of Berlin and Duke of Dalmatia. He nearly annihilated the Spanish army at Burgos (November 10, 1808), took from the English Corunna and Ferrol, and occupied Oporto and N. Portugal, whence Wellington expelled him. On March 11, 1811, he secured Badajoz through the treachery of the Spanish commander; but Wellington carried it by assault with fearful loss on the night of April 6, 1812. Disapproving of King Joseph's proceedings, Soult asked to be relieved; but Napoleon ordered him to assume the chief command and retrieve Joseph's crushing defeat at Vittoria, June 21, 1813. He was defeated at Orthez, February 27, 1814, and forced back to Toulouse, where he made a heroic resistance until he received the news of Napoleon's first abdication. After accepting the Ministry of War from Louis XVIII, he rejoined Napoleon, served at Waterloo, was in exile, 1816–19, reinstated as a marshal in 1820, and in 1827 was made a peer. Under Louis Philippe he was Minister of War, 1830–31; Premier, 1832–34, and again from 1839–47, when he retired as marshal general.

Sound, The, a narrow strait, one of the passages between the Cattegat and the Baltic, and separating the island of Seeland from Sweden. It extends N. and S. 66 m., and opposite Copenhagen is about 15 m. wide. The name is properly confined to its narrowest part, which between Elsinore and Helsinborg is only 3 m. wide. Denmark formerly held both sides of the strait, and taxed all vessels passing through the Sound; but this right was bought off under treaties concluded in 1857.

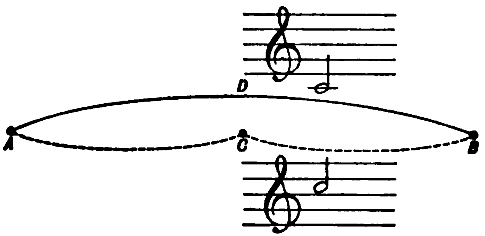
Sound is the sensation produced when certain vibrations are excited in the ear. This sensation is produced by the transmission of the vibrations to the ear by some elastic fluid, such as air. (For the physiology of hearing, see EAR.) Acoustics is the study of the nature, production, and perception of sound.

That sound is a vibration, or wave motion, can be shown by setting in vibration a tuning fork and holding it close to the surface of a glass of water. The vibrations of the tuning fork will be transmitted to the surface of the water, and minute ripples will spread out to the sides of the glass. Sound waves can also be reflected from properly arranged surfaces producing echoes, such as in the old Representative Chamber in the Capitol at Washington, where a whisper at one part of the room will be reflected from the walls and returned to another part of the chamber. An echo at Woodstock Park, England, repeats seventeen syllables by day and twenty by night, while in St. Paul's Cathedral, London, the faintest sound is conveyed from one side of the dome to the other, but is not heard at any intermediate point (Tyndall). If a vibrating body be surrounded by a vacuum, as in an air pump, no sound will be transmitted.

The relation of the quickness of the succession of the wave vibrations to the pitch of a sound can be shown by spikes of a toothed wheel striking upon a tongue of metal fixed against it. With every increase in the rapidity of the vibrations of the metal tongue the sound produced will rise in pitch, or shrillness, and this increase will bear a constant relation to such rate of vibration. Below 16 vibrations per second the sound will be an unmusical noise or rattle, but as the rate is increased this will become a low hum, which will gradually rise with the increased speed till it reaches the utmost shrillness appreciable by the human ear. By using the electric spark, also, the sound waves can be made visible. Musical sounds are those produced when the vibrations are regular in their succession; noise is the sensation produced by single, or irregular, vibrations. Many people cannot hear sounds of 12,000 vibrations per second or over, so the shrill cry of the bat or the squeak of a mouse cannot be perceived by them. The upper limit of the human ear seems to be about 40,000 vibrations per second, therefore some of the shrill sounds emitted by insects cannot be directly sensed.

When a gun is discharged at a distance the flash is seen, and an appreciable moment of time then elapses before the report is heard. This is because the vibrations of light, *i.e.*, the flash, are transmitted through the air at a much greater speed than the vibration waves of sound. Experiments show that sound travels through the air at the rate of 1,089 ft. per second at 0° C., and that this rate increases for every degree of temperature because, the air being expanded by heat, there is a less number of air particles to be set in motion between the resonant body and the observer. Sound is transmitted more readily through fog and mist than through the clear air of a summer day. The velocity of sound through water is four times its velocity in air, and through iron the velocity is seventeen times the rate through air. In addition to the pitch, as determined by the number of vibrations, and the loudness, due to the intensity of the motion, there is another element which enters into sounds, known as quality, or acoustic color, or clang tint, which is due to the blending of the overtones with the main vibrations.

If a string be stretched between two points and then set in vibration it will be found that while the string is in motion as a whole this vibration is accompanied by subsidiary vibrations of each half and quarter of the vibrating length. If vibrating string A B be lightly touched at C the vibration D will be stopped, but the string will continue to vibrate from A to C and C to B, and the tone produced will be the octave above the sound produced by the whole string. These harmonics are utilized by violin players, and their mastery is one of the hardest parts of the technic of that instrument. If these harmonic or subsidiary waves of sound chime in well with the main note, the result, as in the violin or piano, is pleasing to the ear; but if the overtones are not harmonious the resultant note will be harsh and discordant, though still retaining its quality as music as distinguished from noise.



The pitch of musical sounds is measured from C, which is produced by 256 vibrations per second. If this number of vibrations be doubled, the octave of C is produced, and every doubling of the rate of vibration produces a combination which gives the ear a sense of agreement as if the notes were felt to be related in some way to each other. The simultaneous sounding of notes of different rates of vibration, if the result is unpleasant, produces discord, or, if the result is pleasant, harmony. To Europeans and Americans a combination of notes whose rates of vibration is represented by the ratio 4:5:6: is generally pleasing, and is known as a major triad.

If two notes are nearly but not quite in accord, the resultant note will alternate between a rise and fall in loudness as the constituent waves converge and diverge from each other; these alternations are called beats. A similar phenomenon is noted in the case of a moving, sound-producing object, as the whistle of a rapidly approaching train; the traveling sound waves follow each other so quickly that the pitch of the note is raised, and lowered as the whistle recedes from the observer.

Sound'ing, the operation of trying the depth of water and the quality of the bottom, especially by means of a plummet sunk from a ship. In navigation two plummets are used, one called the hand lead, weighing about 8 or 9 lb., used in shallow water, and the other, the deep-sea lead, weighing from 25 to 30 lb. The nature of the bottom is commonly ascertained by using a piece of tallow stuck upon the base of the deep-sea lead, and thus bringing up sand, shells, ooze, etc., which adhere to it. The scientific investigation of the ocean and its bottom has rendered more perfect sounding apparatus necessary, and has led to the invention of various contrivances for this purpose, among the most simple and common of which is Brooke's sounding apparatus.

Some of the deepest sea soundings yet obtained that can be relied on have been obtained by the *Challenger*.

Sour'wood. See SORREL TREE.

South Af'rican Repub'lic. See TRANSVAAL.

South African War. See BOERS.

South Amer'ica. See AMERICA, S.

Southamp'ton, Henry Wriothesley (third Earl of), 1573–1624; English statesman; was a patron of Shakespeare, who dedicated to him "Venus and Adonis" and "The Rape of Lucrece." He was a friend of the Earl of Essex, whom he accompanied to Cadiz, and in 1599 to Ireland; was accused of complicity in the treasonable designs of Essex; protested his innocence; was convicted, and sentence of death and attainder was pronounced, but Elizabeth remitted the death penalty, and the attainder was removed by Parliament soon after the accession of James I. He was an assignee of the patents of settlement of Sir Walter Raleigh, and took a prominent part in the early colonization of America, and in the second charter of Virginia his name occupies a leading position, and he became governor of the Virginia Company. In Parliament he was a firm supporter of liberty, and in 1621 was committed to close custody by the king, but released through the influence of Buckingham. He soon after went with his son, Lord Wriothesley, to the Netherlands, to aid the Dutch in their struggle against Spain, and took command of a regiment. Died at Bergen-op-Zoom.

Southampton, seaport in Hampshire, England; 79 m. SW. of London. Of the walls built in the time of Richard II there are considerable remains. Southampton contains many old buildings, among which is the *Domus Dei*, an hospital dating from the thirteenth century; also St. Michael's Church (1080). The old docks (1842 and 1851) have been extended, and a new tidal dock was opened, 1890. A graving dock, the largest in Great Britain, was opened, 1895. Mail steamers for the U. S., the W. Indies, Brazil, and S. Africa arrive and depart here. There are large exports of British manufactures. Provisions, etc., from France and the Channel Islands, and cattle from Spain and Portugal are imported. Shipbuilding and the manufacture of engines are carried on. The present town was founded by the W. Saxons soon after 495. Pop. (1908) est. at 122,196.

South Austra'lia, one of the seven British colonies of Australasia, occupying a central N. and S. band of Australia, from the Arafura Sea to the S. Ocean, with Queensland, New S. Wales, and Victoria on the E., and W. Australia on the W. The greatest length is 1,850 m. N. and S., and the average breadth, 650 m. It also embraces many islands, of which the largest are Kangaroo Island (1,700 sq. m.), off the mouth of St. Vincent Gulf; Melville Island (80 m. long by 30 broad), and Bathurst Island, both off Port Darwin; and Groote Eylandt (about 40 m. in each direction), in the Gulf of Carpentaria. Total area, 903,690 sq. m. The district N. of the parallel of 26° S. is called the N. Territory, and is practically separate from the S. portion, with Palmerston as its capital.

The interior is little known, but in the center is a mountainous region, with but slight elevations, rarely surpassing 3,000 ft. The culminating range seems to be the McDonnell. To the S. of the mountains is a district with many bodies of water called lakes, but are really salt-water lagoons. W. of the mountainous and lagoon districts and along the W. boundary is a desolate region forming an extension of the Great Victoria Desert, and the Great Sand Desert of W. Australia. Arnhem Land is an elevated plateau sloping gently toward the E. and abruptly toward the N. To the W. of it the country is better watered and more fertile. The climate about Adelaide is like that of S. France or N. Italy. The N. Territory is tropical, resembling Guinea and central America, and, in the interior, the Sahara.

The most important mineral is copper, and the colony owes its continued existence at a critical time to the discovery of the Burra Burra copper district, 90 m. N. of Adelaide. The mines were developed in 1845, and for some years paid eight hundred per cent on the investment, but were abandoned in 1864 because of the difficulty of transport, and reopened on the construction of the railway from Adelaide to Kuringa. Gold is obtained from mines in the hills S. of Adelaide (at Echunga, etc.) and at other places, but chiefly from the N. Territory, where there is a large alluvial and auriferous quartz region 100 to 150 m. S. of Port Darwin. Gold was discovered in 1852. S. Australia is essentially an agricultural and pastoral country; it is called "the granary of Australasia," but only about one third of one per cent of the area is under cultivation; seventy-five per cent of this was in wheat, twenty-one per cent hay, and less than one per cent each for vines, oats, barley, and potatoes. Vine growing and the making of wine receive much attention. Pop. (1907) 392,431; capital, Adelaide (1907) 178,300. Revenue (1906–7), £3,195,285; expenditures, £2,897,612; imports (1906), £9,702,264; exports (1906), £11,933,171. Executive, a governor appointed by the crown, with a council of ministers. Parliament consists of a Legislative Council and a House of Assembly, elected by adult suffrage with certain property qualifications. The colony was founded 1836, but was not firmly established till 1856. In 1862 Stuart crossed the continent from S. to N., and in 1863 the N. Territory was granted to S. Australia.

South Bend, capital of St. Joseph Co., Ind.; on the St. Joseph River, 85 m. E. of Chicago. It is in a rich agricultural region. S. Bend is the seat of the Univ. of Notre Dame (Roman Catholic), founded in 1842. The census returns of 1900 showed 302 factories turning out products valued at $14,236,331. The leading industry is carriage and wagon making; agricultural implements rank second. Here La Salle landed in 1679 on his tour of exploration to the Mississippi, and here he camped many times thereafter. It was then the site of a large village of Miami Indians, and inhabited by the Pottawatomies in later years. Pop. (1907) est. at 44,605.

South Beth'lehem, borough in Northampton Co., Pa.; on the Lehigh River. It was settled in 1741, but its growth dates from 1850. The Bethlehem Iron Company is the principal manufacturing establishment, but there are other metal works and several wood-working, knitting, and silk mills. The Lehigh Univ. is in the borough. Pop. (1900) 13,241.

South Caroli'na, one of the U. S. of N. America, popularly known as the PALMETTO STATE, area 30,570 sq. m., of which 400 sq. m. are water surface. A great geologic break passing through the state near Cheraw, Columbia, and Aiken divides it into the "up country" of Primary formation, and the "low country" of Tertiary, with Cretaceous outcroppings. The up country is subdivided into the Alpine and Piedmont regions, which are notable for granite, gold, and other minerals, especially large deposits of iron. The Sandhill or Pine region (2,000 sq. m.), the beach of a former age, stretches across the state. The Red Hills (1,500 sq. m.), skirting the sandhills, are Eocene. The Upper Pine-belt (5,000 sq. m.) comprises some of the finest farming lands, both gray and "mulatto" or chocolate lands. Here was produced the largest yield of corn (256 bu. to an acre) ever gathered. The Lower Pine-belt (9,000 sq. m.) comprises the lower tiers of countries, excepting the salt-water region; it has phosphate deposits. The Coast region (1,500 sq. m.) is Post Pliocene.

There is much water power in the state. The Catawba River falls 178 ft. in 8 m. The Columbia Canal, on the Congaree, has developed 13,000 horse power. The chief rivers are the Savannah, the Santee, and the Pee Dee system, consisting of the Great Pee Dee (the Yadkin in N. Carolina), the Little Pee Dee, Lynch's, Black, and Waccamaw. The Ashley and the Cooper rivers, forming Charleston harbor, the Edisto, Ashepoo, Combahee, and Coosawhatchie, are smaller streams. There are no important lakes. Cotton, maize, wheat, rice, peas, hay, and sweet potatoes are the chief staples. The Sea Islands grow 10,000 bales of the famous long-staple cotton per annum, and the fields produce from 500,000 to 900,000 bales of the short staple. In 1908 the cotton crop amounted to 1,242,012 bales. Tobacco growing, truck farming, and fruit growing are developing. Stock raising, once profitable, then neglected, has been revived. Hired field labor is supplied by negroes, but there are many small farmers among the whites, especially of the Piedmont region, who work their own crops.

The climate is mild, and, except in the swamp and rice regions, is salubrious. The equable and dry climate of some portions, as the pine lands, is favorable for sufferers from pulmonary complaints. Aiken and Somerville are noted health resorts. Other localities attract winter tourists, and the Alpine and Piedmont regions are much frequented in summer. The mercury rarely reaches 100° in summer, or falls below 13° above zero in winter. Snow is practically unknown below Columbia. Cyclones visit the coast apparently in periods of four, seven, and eleven years each. One in August, 1893, did much damage in Beaufort, Charleston, and Port Royal, and on the Sea Islands. A severe earthquake visited the state in 1886, doing great injury to Charleston. Principal cities and towns are Charleston, Columbia, Greenville, Spartanburg, Sumter, Anderson, Rock Hill, Union, Greenwood, Florence, Newberry, Orangeburg, Georgetown, Beaufort, Chester, Laurens. Pop. of state (1910) est. at 1,600,000.

Manufacturing industries of the state in 1905 had a total capital of $113,422,224; the raw material used was valued at $49,968,626, and the output at $79,376,262. In 1900 there were ninety-three cotton mills with 1,693,649 spindles, and twenty-five new mills under construction. The cotton-seed industry is new, but growing. Assessed valuations in 1906: Real property, $130,516,016; personal, $119,018,406.

A majority of the first settlers were dissenters. The first Huguenot church (the only one in America still preserving its old form of worship) was built abt. 1681; first English church abt. 1682; first Baptist, 1685; first Quaker, 1696; first Scotch Presbyterian, 1696; first Jewish, 1750; first Lutheran (in Charleston), 1759, and the first Methodist, 1785; and the first mass was celebrated (in Charleston) in 1786. An act of the assembly in 1712 allowed negro slaves to join the church. The war of 1861–65 closed many schools. In 1868 a public-school system was provided, which is steadily improving. The races are taught separately. In the school year ending June, 1907, the school population was 509,851; in 1907–8 the enrollment was 319,614; teachers, 6,436; school buildings, 5,048; expenditures of the year, $1,595,986.36. The enrollment showed 146,647 white pupils and 172,967 colored, and 2,626 teachers were colored. The state has two higher institutions of learning—the Univ. of S. Carolina, founded in 1805, and the Clemson Agricultural College, founded in 1893. There are a number of small colleges and many private institutions. Claflin Univ. at Orangeburg is endowed by part of the national land grant.

In 1892 the legislature prohibited the sale of liquor by private persons, and established state and county dispensaries. Liquors, chemically pure, put up in sealed packages, are sold by salaried county dispensers in the daytime to temperate persons, who are not allowed to open the package on the premises. The profits are divided between the state and local treasuries, a portion being devoted to the schools.

In 1520 Spaniards visited Port Royal and kidnaped Indians. The first attempt to colonize the territory now comprised in S. Carolina was made by Ribault in 1562 and 1565. The province of Carolina was created by Charles II in 1663. The first permanent settlement in S. Carolina was made on Ashley River in 1670 by English colonists, who removed in 1680 to the present site of Charleston. In 1685 many French Huguenots arrived. Under the name of Carolina, both the present states of N. and S. Carolina were held as a proprietary government till July, 1729, when the king bought out the proprietors, and formed two royal colonies. S. Carolina suffered from Indian depredations, and with Georgia was engaged under Oglethorpe in a contest with the Spanish settlements in Florida. It was the scene of severe warfare during the revolutionary struggle, hotly contested battles being fought at Fort Moultrie, Charleston, Camden, King's Mountain, Cowpens, Eutaw Springs, etc. The British held the country for the greater part of 1780 and 1781.

A state constitution was adopted March 26, 1776; the Constitution of the U. S. was ratified by S. Carolina, May 23, 1788. In November, 1832, a state convention adopted the "Nullification Ordinance," which pronounced the high tariff of 1828 and 1832 "null, void, and no law, nor binding on this state, its officers and citizens," and prohibited the payment of duties on imports imposed by that law within the state after February 1st ensuing. It was also declared that should the general government attempt to enforce the law thus nullified, or to interfere with the foreign commerce of the state, the people of S. Carolina would "hold themselves absolved from all further obligation to maintain or preserve their political connection with the people of the other states." Pres. Jackson ordered Gen. Scott to Charleston, and issued a proclamation in which he held that nullification was treason, and should be punished as such. But as Congress passed the compromise tariff, which was acceptable to S. Carolina, the course threatened by that state was not pursued.

S. Carolina was the first of the states to institute active measures for withdrawing from the Union on the election of Lincoln, and the first to pass an ordinance of secession. On November 7, 1860, an act was passed by the legislature calling a state convention. The ordinance of secession was adopted, December 20th. On the 24th, Gov. Pickens proclaimed the dissolution of the union between S. Carolina and the other states. On the 27th, Fort Moultrie and Castle Pinckney were seized by the state. The bombardment and capture of Fort Sumter, April 12th–13th, by Gen. Beauregard, was the beginning of open hostilities. Hilton Head and Bay Point were captured on November 7th by Admiral Du Pont and Gen. T. W. Sherman. In January, 1865, Gen. W. T. Sherman's army began its march from Savannah through S. Carolina. Columbia was surrendered and Charleston evacuated on February 17th. A convention assembled, September 13th, repealed the ordinance of secession, and declared slavery abolished. By the war the assessed property of the state was reduced from $550,000,000 to $100,000,000 ($200,000,000 being the value of the slaves set free). A refusal to ratify the Fourteenth Amendment led to a reconstruction. In 1868 S. Carolina was restored to the Union.

South Dako'ta, called the Coyote State, one of the U. S. of N. America, the twenty-seventh state admitted into the Union. It is bounded on the N. by N. Dakota, E. by Minnesota and Iowa, S. by Nebraska, and W. by Wyoming and Montana; length from E. to W., 386 m.; breadth, N. to S., 240 m.; area, 76,850 sq. m.; pop. (1910) est. at 575,000, about one sixth are foreign born. The Missouri River divides S. Dakota into two nearly equal portions. The E. part is generally smooth and rolling, but the W. rises more rapidly, and culminates in the Black Hills in Harney's Peak (7,400 ft.). The climate is dry and bracing, temperature ranging from 40° F. to 110° F.; the average rainfall varies from 30 to 40 in. The Bad Lands (French, *Mauvaises Terres*), near the head of White River and extending into Nebraska, are a striking feature, with cañons, depressions, walls, and castles of white earth, a desert region rich in soil-making chemicals and abounding in fossils. The gently sloping lands of the E. portion, and the intervals and parks of the Black Hills and the valleys near them, are the most fertile soils. The river bottoms are rich and fertile, while the more rolling or hilly lands are dry and less productive. The Big Sioux River flows S. near the E. border. Its current is swift, and there are rapids falling 110 ft. at Sioux Falls. The Dakota (or James) River, 80 m. W., is a sluggish stream 200 to 400 ft. lower than the Big Sioux. W. of the Missouri the streams in order of their size are the Cheyenne, Grand, White, Bad, and Moreau. A long artesian basin stretches across the state, and the wells

are used to supply towns, furnish power, and irrigate the lands.

At Sioux Falls, Dell Rapids, Spencer, Rockport, and near Alexandria are extensive quarries of red quartzite, and at Yankton thick beds of Fort Benton clay and chalkstone, from which a superior Portland cement is made. Brick clays are found in many localities. Tin is found in the Harney Peak and Nigger Hill regions of the Black Hills, and the first tin mill in the U. S. was opened here in 1890. During 1899 the Black Hills yielded 312,962 fine ounces of gold, valued at $6,469,500, and 145,600 fine ounces of silver, valued at $188,251. In 1907 the product of gold was valued at $4,138,200, and silver at $70,400. Granite, sandstone, and limestone are quarried. The Sioux Falls quartzite has been used for paving in Chicago and other cities with good results. The chief industry of S. Dakota is agriculture. Stock raising has become an important interest. In 1900 S. Dakota had 52,622 farms, containing 19,070,616 acres, valued at $220,133,190. The crops in order of their value are: wheat, corn, oats, hay, potatoes, barley, and rye. The yield of wheat in 1908 was 37,862,000 bu.; of corn, 57,677,000 bu., and oats, 31,395,000 bu. There are about 40,000 acres in the state under irrigation.

The chief manufacturing industries of the state are the making of butter, cheese, and condensed milk, and flour and grist milling. The institutions for advanced instruction include the Univ. of S. Dakota at Vermillion, Dakota Univ. at Mitchell, Pierre Univ. at E. Pierre, Sioux Falls Univ. at Sioux Falls, a State Agricultural College, and a State School of Mines. There are also Indian schools maintained by the state.

S. Dakota as well as N. Dakota was included in the Louisiana Purchase of 1803; in 1861 Dakota Territory was organized, including a great part of what now constitutes Montana and Wyoming. The pop. of the territory was at this time abt. 3,000; in 1868 the area of the territory was much reduced, and in 1870 the pop. was abt. 135,180. In 1889 N. and S. Dakota were admitted into the Union as states.

Principal cities and towns are Sioux Falls, Lead City, Yankton, Aberdeen, Mitchell, Deadwood, Watertown, Huron, Madison, Brookings, Pierre, Vermillion, Canton, Webster.

South'ern Cross, a constellation visible in the S. hemisphere, the four largest stars of which are arranged, roughly, in the form of a cross.

Southern Wood, a plant. See Artemisia.

Southey (sowth'ĭ), **Robert,** 1774–1843; English author; b. Bristol; received his early education at Westminster School; in 1793 entered Baliol College, Oxford, with the design of taking holy orders, but left Oxford after two years, and entered upon a career of authorship, his first work being a small volume of poems (1794). He was made secretary to the Chancellor of the Exchequer for Ireland, a sinecure with a salary of £350, but resigned, and in 1804 settled for life at Keswick. He was named poet laureate in 1813. In 1807 he received a pension of £160 a year, increased to £460 in 1835. His wife died in 1837, and two years afterwards he married Caroline Bowles. But Southey's faculties had begun to give way, and on the day when he brought his wife to their home he fell into a state of mental prostration which soon grew into complete imbecility.

Southey's principal poems are "Joan of Arc," "Thalaba the Destroyer," an Arabian tale; "Madoc," founded on legends of early Welsh voyages to America; "The Curse of Kehama," based upon Hindu mythology; "Roderick, the Last of the Goths," founded on Spanish history; "A Vision of Judgment," an apotheosis of George III; and "A Tale of Paraguay." Among his numerous prose works are "History of Brazil," "Life of Nelson," "Life of John Wesley," "History of the Peninsular War," "Book of the Church," "Sir Thomas More, or Colloquies on Society," "Life of John Bunyan," and "The Doctor." Southey was one of the most indefatigable and voluminous of English authors, his published works numbering over 100 titles. His reputation as a poet, imposing in his own lifetime, has steadily declined. His poetry is commonplace, without inspiration, spontaneity, or charm of style. The worth of his character, his wide learning and incessant productiveness, his dignified social standing, and his intimate association with Wordsworth and Coleridge, men of a higher genius than his own, still make him an important figure in English literary history.

South Geor'gia, a group of uninhabited islands, generally icebound, nearly 800 m. E. by S. of the Falkland Islands, of which they are a dependency; area about 1,000 sq. m.; first discovered in 1675.

South O'maha, city of Douglas Co., Neb.; adjoining Omaha on the S. Is the third largest meat-packing city in the U. S., and has extensive stock yards and five large packing and rendering plants. Pop. (1906) est. at 36,765.

South'port, town in Lancashire, England; 18 m. N. of Liverpool. Southport from being a sandy waste has rapidly developed into a popular watering place. Pop. (1901) 92,832.

South Sea Bub'ble, a financial speculation which arose in England about the same time as Law's Mississippi Scheme in France. The South Sea Company was established by Lord Treasurer Harley in 1711 with the design of providing for the extinction of the public debt (£10,000,000). The debt was assumed by a number of merchants, the government to pay six per cent interest for a certain period, securing this sum by making permanent certain import duties. The purchasers of the fund were to have a monopoly of the trade to the S. Sea or the coast of Spanish America, and were organized as the South Sea Company. Though the S. Sea trade yielded no great profit, the company flourished from the prevailing delusion with regard to the riches of Spanish America, and vied with the Bank of England in controlling the finances of the country. After the Peace of Utrecht, Spain refused to open her commerce to England, and the privileges of the South Sea Company became worthless. In 1720 the company assumed the entire debt of over £30,000,000, bearing interest of five per cent. The ministers intended to give the company a good bargain, but the House of Commons voted to open the scheme for competition to the Bank of England also. The company was thus compelled to offer £7,500,000 for its privilege.

Notwithstanding this drawback the stock was in great demand, under the extravagant expectation of profits from the American trade and the prevalent rage for speculation. It was increased by successive subscriptions, the price of shares rising till £1,000 was paid for a single share of £100. Other bubbles were started, such as schemes for a fishery of wrecks, to make salt water fresh, to make oil from sunflowers, to extract silver from lead, all with promises of enormous profits. For lack of office room the streets near 'Change Alley were lined with desks. The action of the South Sea Company itself in proceeding against some of these bubbles turned attention to its own affairs, and distrust arose, under which the stock declined. Confidence was further weakened when it became known that some of the directors had sold out. The failure of Law's scheme opened all eyes to the delusion, and as the year 1720 closed the bubble burst, bringing ruin to the company and to thousands of families. An investigation ordered by Parliament disclosed much fraud and corruption. Some of the directors were imprisoned; and all of them were fined to an aggregate of over £2,000,000 for the benefit of the stockholders.

South Shet'land, or New South Shetland, Is'lands, an Antarctic archipelago, S. of S. America, between 61° and 63° 30′ S. lat., consisting of Clarence, George First, Livingston, and Smith islands, discovered 1819; area about 850 sq. m. The islands are mountainous, destitute of vegetation, in the interior covered with perpetual snow and ice, and rise out of very deep water. They are visited by whalers, but navigation is dangerous on account of the ice.

South'well, Robert, 1560–95; English author. He became a Jesuit at Rome, 1578, and in 1586 was sent as a missionary to England. He was imprisoned in the Tower in 1592, was ten times subjected to the torture to make him disclose a plot against Elizabeth, and was executed at Tyburn. His most important poems are contained in "St. Peter's Complaint and other Poems." His chief prose works are "The Triumph over Death" and "Epistles of Comfort to Those Catholics Who Lie Under Restraint."

Souvestre (sō-vĕstr'), **Émile, 1806–54**; French novelist and dramatist; b. Morlaix, France. After editing a newspaper at Brest, he settled in 1836 in Paris, where he attracted attention first by his sketches of Brittany, and became soon popular as a writer. The most remarkable of his novels are "Les Derniers Bretons," "L'Homme et l'Argent," "Confessions d'un Ouvrier," "Un Philosophe sous les Toits"; and of his dramas, "Henri Hamelin," "L'Oncle Baptiste," "Le Mousse," etc. All his works have a strongly marked tendency, representing morality and riches as incompatible.

Sov'ereign, the British coin representing the pound sterling of 20*s*. It first appeared in 1817, and now weighs 123.27447 grains troy, and is worth $4.866 in U. S. money. The English coin first called double royal (afterwards replaced by the guinea), first struck about 1489, was often called the sovereign. Its value varied from 20*s*. to 30*s*., but its original value was 22*s*. sterling.

Sov'ereignty, the possession of the highest power in any given sphere, as in the state. The debates concerning the supreme power, whether it resides by right in the people—*i.e.*, the organized people—ultimately, or in some ruler who received it from God, led to the application of the word to the former as the source from which the right of the particular magistrate or line of kings was derived, and to the latter as invested by the former with his power according to the will of God. In the English usage the king or queen is called sovereign, although possessed of an authority limited by law. Yet, as in theory all executive power is derived from that of the monarch, the term sovereign contains no absolute misnomer.

Sovereignty in public law is the right to exercise uncontrolled the powers of the state. The internal sovereignty of a state includes all those powers which it possesses over its own subjects and transient foreigners within its territorial limits and on its merchant ships on the high seas. Such are those of eminent domain, taxation, legislation, punishment, etc. Thus the internal sovereignty of the U. S. was complete from the declaration of its independence. External sovereignty, being the right to enter into relations with other states, for which intercourse their consent is necessary, depends upon their recognition. In the case of the U. S. this was made by France through the Treaty of 1778; by Great Britain in express terms by the Treaty of 1782. When a state exercises some but not all of the powers of external sovereignty, it is called a dependent or semisovereign state, *e.g.*, Bulgaria.

Under the U. S. Constitution the question whether the several states or the U. S. are invested with the sovereignty has been a great contention. The following considerations are worthy of notice:

In the provisional articles of peace between the U. S. and Great Britain (1782), and in the Treaty of 1783, the king acknowledges the U. S. "to be free, sovereign, and independent states," "treats with them as such," and "relinquishes all claims to the government, propriety and territorial rights of the same, and of every part thereof." The meaning of this is that he, and no one else, had any claims of sovereignty over the territory of the U. S., and that by relinquishing those claims he left them in the same condition in which other states independent of all external powers were by the nature of their situation placed. The thirteen states were at that time confederated, but of this confederation he took no notice.

The limitations imposed by the Federal Constitution are well expressed in Pres. Jackson's proclamation of December, 1832: "The states severally have *not* retained their entire sovereignty. It has been shown that in becoming parts of a nation, not members of a league, they surrendered many of their essential parts of sovereignty. The right to make treaties, declare war, levy taxes, exercise exclusive judicial and legislative powers, were all of them functions of sovereign power. The states, then, for these important purposes were no longer sovereign. The allegiance of their citizens was transferred, in the first instance, to the government of the U. S.; they became U. S. citizens, and owed obedience to the Constitution of the U. S. and to laws made in conformity with the powers it vested in Congress. This last position has not been and cannot be denied. How, then, can that state be said to be sovereign and independent whose citizens owe obedience to laws not made by it, and whose magistrates are sworn to disregard [its own] laws when they come into conflict with laws passed by another? What shows conclusively that the states cannot be said to have reserved an undivided sovereignty is that they expressly ceded the right to punish treason—not treason against their separate power, but treason against the U. S. Treason is an offense against *sovereignty,* and sovereignty must reside with the power [able] to punish it."

Sow'ing and Sowing Ma'chines, the act or process of depositing seed in the ground, and the machines used for the purpose. When seeds are deposited singly or with only a few in a definite spot, the act is usually called *planting,* the term *sowing* being restricted to cases where the seed is thrown broadcast or deposited in rows or drills. Sowing or planting is usually performed in the spring, but sometimes, and with some kinds of crops, in the autumn, so that the plants may have a fair start when the spring opens. The seeds are usually covered over by harrowing, brushing, or rolling the soil after they have been deposited. As a rule, it may be laid down that when the soil is rather firm and the climate moist, little depth of covering is required; but when the soil is loose and the climate dry, the seeds should be covered to a depth of twice or more their thickness. Machines, more or less complex, have been in use from time immemorial for performing the operation of sowing or planting in all its forms. Some scatter the seed broadcast; others dibble it into the ground in rows or drills, and then cover it, the general principle being that the drills should be at such a distance apart that a horse drawing a light plow may pass between the drills without injuring the plants. In the larger machines, often drawn by horse power, the seed is often placed in small cups, from which it passes through tubes so arranged as to allow them to drop regularly into shallow furrows cut by coulters just in front of the escape orifice of the tubes, the furrows being closed up by a kind of rake or harrow following immediately after and forming a part of the machine. There are many kinds of seed drills and planters in use.

Soy Bean, the *Glycine* (or *Soja*) *hispida*; a bean extensively grown in Japan, China, India, and the Spice Islands, where it is much used as food. The sauce called soy is made of boiled soy beans, mixed with wheat meal and fermented. It is then salted and mixed with water, and after daily stirring for a long time the supernatant liquid is poured off and preserved. Good soy is a spirited and excellent sauce, and is believed to improve with age. The plant is coming into notice in the U. S. for forage.

Space, as defined by Aristotle, "the first and unmoved limit which bounds body" when taken as finite space or *place*; taken as space in general, it is "the unmoved limit of whatever is moved"—*i.e.,* of all bodies. Time, on the other hand, should be, according to him, the number and measure of movement. The existence of pure space is evident, he says, from the fact that things change places; yet in spite of its three dimensions it is not to be confounded with body, for in that case two bodies would coincide; it is not cause; there is no place in which space itself exists; nor does space grow with what grows. Matter and form are inseparable, but extension and limiting surface are separable; hence matter and form do not explain them, as was thought by Plato in the *Timæus,* where he makes space to be the primitive matter of the universe; it is not form, for space remains when the form is removed. As ultimate logical condition it has frequently been identified with the infinite, or made to be a divine attribute. Newton suggested that God by existing constitutes time and space. Locke thought that he could trace the idea of space to the senses of touch and sight; most of his followers have adopted the same doctrine, making it a generalization from experience gained in the perception of bodies. Accordingly, they ignore in different ways the attributes of universality and necessity which are the distinctive characteristics of *a priori* ideas, and make unbroken custom or habit to be the explanation of the inability or impotence of the mind which we call inconceivability.

Spa'his, or Sipa'his, the name given to the irregular Turkish cavalry, which is said to have been organized by Amurath I, and which gave place in 1826 to regular cavalry. Their usual arms were the saber, lance, and javelin. The French call a body of light cavalry raised in Algeria by the name of spahis. The name sepoys given to the native troops in British India is a variation of the word.

Spain, kingdom of Europe occupying more than four fifths of the Iberian Peninsula, which it divides with Portugal, and separated from France by the Pyrenees. It includes the Balearic Islands, the Canary Islands, and the town of Ceuta on the Moroccan coast. It consists of forty-nine provinces; area, 194,783 sq. m.; pop. (1900) 18,618,086. Until 1898 it also had colonies—in America: Cuba and Porto Rico; in Asia: the Philippine, Sulu, Caroline, and Marianne islands; in Africa: Rio de Oro, Adrar, and several small towns and islands on the N. and W. coasts, making altogether under Spanish control 603,000 sq. m. As a result of the war with the U. S., Cuba, Porto Rico, Guam, and the Philippines were lost to Spain.

The Peninsula is separated from Africa by the Straits of Gibraltar, 15 m. across. The center of the Peninsula is formed by a mass 1,500 to 3,000 ft. high, and separated into several river basins by mountain chains running approximately E. and W. The plateaus of Leon and Old Castile occupy the N., and that of New Castile the center. The Pyrenees cross the isthmus from the Bay of Biscay to Cape Creus on the Mediterranean. The culminating points are Mount Perdo (10,997 ft.), and Posets (11,047 ft.), and Mount Aneto (11,170 ft.). Toward the E. end of the chain the little republic of Andorra lies between France and Spain. The Pyrenees are continued W. by the Cantabrian Mountains for 350 m. They rise directly from the ocean on the N., but on the S. they pass into plains 2,500 to 3,000 ft. above sea level. The highest point is the Torre de Ceredo (8,786 ft). The Sierra Nevada borders the Mediterranean along the S. coast, and is higher than the Pyrenees. Between the N. and S. coast ranges are four other principal and many minor chains, which divide the river basins, ramify, join together, or are lost in the central mass, covering Spain with mountains usually rough and wild, yet not offering difficulties to intercommunication.

The largest streams flow W., through Portugal, into the Atlantic. The largest stream flowing into the Mediterranean is the Ebro (440 m.), which drains the Pyrenees and E. Cantabrian slopes. The longest river is the Tagus (566 m.), which crosses the Peninsula nearly centrally, flowing W., and empties into the Atlantic. The next in size is the Portuguese Douro (Spanish, Duero). It drains the table-land of Old Castile, and empties into the Atlantic. The Guadalquivir (316 m.) and Guadiana (316 m., with the Zancara, 510 m.) empty into the Atlantic on the Gulf of Cadiz. The rivers, so far as they lie in Spanish territory, are of little use for navigation, except the Guadalquivir, but are used for irrigation. The amount of flow is unequal, being very small in summer and autumn.

The climate in the interior table-lands is generally continental, rigorous and dry, that of the E. coast dry and mild, that of the S. coast moist and hot, and that of the N. slope cool, wet, and stormy. Madrid has only 11 in. of annual rainfall, less than that of Denver, but more than that of El Paso. The summer temperatures in the interior are the hottest in Europe.

The mineral wealth of Spain has been known from the most ancient times, and its richness in gold made it the California of the Carthaginians and Romans. The production of gold has long failed, but Spain still continues the richest country in Europe in other mineral products. Iron is abundant in the mountains, especially in the Biscayan provinces; lead is abundant; argentiferous lead is extensively distributed, and the mines at Linares are important; copper is worked at many places, principally to the N. of Huelva; cinnabar has been taken out at Almaden from the time of the Romans; and rock salt, marble, plaster, mineral fertilizers, and coal offer large resources. The wealth of Spain in mineral and thermal springs is even more unique than her wealth in minerals. These occur chiefly at the foot of the Pyrenees and of the Sierra Nevada.

Of the lands, eighty per cent is classed as productive, and of this thirty-four per cent is devoted to agriculture, twenty-one to fruits, twenty to meadows, four to vineyards, and two to olives. The great variations in altitudes permit the productions to range through those of the subtropic and temperate zones. The leading crops are wheat, rye, barley, maize, rice, esparto, flax, hemp, and pulse. The product of wine is very large and highly valued; it is the chief item of export. Raisins, almonds, oranges, olive oil, and conserves are also largely exported. Cork is chiefly furnished by Spain, though the cork tree grows in SW. Europe and N. Africa. The Spanish races of sheep, cattle, and horses are all celebrated. The imports are chiefly wheat, cotton, raw or manufactured, coal and coke, drugs and chemicals, sugar, machinery, tobacco, and woolen goods. The chief exports are wine, minerals and ores, cork, boots and shoes, cotton textiles, fruits, oil, and wool. The trade is chiefly with France, Great Britain, and the U. S. In 1907 the imports were rated at 932,549,000 pesetas ($180,181,958), the exports at 930,851,000 pesetas ($178,854,243).

Spain is a monarchy, under the constitution of 1876. The legislative power is vested in a parliament called the Cortes, consisting of a Senate and a Congress. The senators in part hold life positions by inheritance, or *ex officio*, in part are nominated by the crown, and in part elected, and together number not more than 360. The Congress has 431 elected deputies. All are elected for five years, or until the Cortes are dissolved by the crown. The ministry is responsible, and consists of nine members. The local governments are generally representative. The revenue is derived from direct and indirect taxation, stamp duties, monopolies, and income of public property. The monopolies are the tobacco trade, the lottery, the mint, and others. The public debt of all kinds (funded and floating) in October, 1908, amounted to 9,466,014,792 pesetas ($1,826,280,855), and the principal item in the public expenditure is the payment of the interest charges.

Gibraltar, which controls the Straits, is in the hands of the British. The army and navy are recruited by conscription. The permanent army consists of about 80,000 men, with about 1,200 officers. Of the colonies in 1898, Rio de Oro and Adrar were governed by the province of Canarias, and the others were controlled by governors. Cuba had forty-six representatives in the Cortes.

The present population consists of Iberians, modified successively by intermixture with Celts, Carthaginians, Romans, Goths, Jews, and Moors. With the last came some negro blood, and to the slight intermixture of this blood is probably due the Spanish and Portuguese capacity for tropical colonization. At the same time from Spain has poured out an enormous wave of emigration, which has left its mark on the most of America and several oceanic archipelagoes, and this has had its reaction on purity of Spanish blood. Yet notwithstanding these intermixtures, each lasting through centuries, the people are among the most characteristic, self-contained, and sharply defined of Europe. The linguistic type evolved is essentially Roman, but the ethnic includes the Portuguese, and is clearly distinct from the rest of Europe. The Spaniard, somewhat swarthy, is well balanced as to virtues and vices, vigorous, original, serious, proud, dignified, courteous, tenacious, patriotic, thrifty, sometimes vain, bigoted, intolerant, and vindictive. In the Roman conquest Spaniards were found gallant and warlike, and when overcome they made the most faithful and conservative of the Roman provinces. They formed a fertile and easy field for early Christian missionary effort, and having accepted the Roman supremacy and Christianity they were tenacious of them. With the discovery of America this race displayed to the world its courage, enterprise, and endurance, as well as its indifference to the sufferings of inferior races. The principal cities are: Madrid (pop., 1900, 539,835), Barcelona (533,000), Valencia (213,530), Seville (148,315), Malaga (130,109), and Murcia (111,539), and there are no other cities with more than 100,000. Emigration is chiefly to Brazil, Uruguay, and Argentina.

The national church is the Roman Catholic, and the only professed dissenters number about 30,000, about 7,000 Protestants, 4,000 Jews, and 19,000 of other religions. In 1884 there were 32,435 priests, 1,684 monks resident in 161 monastic houses, and 14,592 nuns in 1,027 convents. Since 1876 private Protestant worship has been permitted. In 1860 only twenty per cent of the population could read and write; in 1889 this had grown to 28.5. Compulsory primary education is statutory, but is not enforced. There are about 26,000 public schools, with 2,000,000 pupils, and 6,000 private ones, with 350,000 pupils. The secondary schools are less efficient. There are 10 universities with 16,000 students. The colonization of the coasts by the Phœnicians (Cadiz), Greeks (Saguntum), and Carthaginians (Cartagena) began abt. 1100 B.C. The Carthaginians conquered about half of the Peninsula in the third century B.C. This was inherited by the Romans, and the conquest completed, 19 B.C. The provinces were thoroughly Romanized. The Gothic invasion was begun in the fifth century A.D., but the Gothic kingdom was overthrown by the Arabs in 711, who remained in control for three centuries. Christian kingdoms were established from the eleventh century until the marriage of Ferdinand V of Aragon and Isabella of Castile united these kingdoms in 1479, and began a career of prosperity, which resulted in the conquest of the Moors and the discovery of America, and gave Spain the form it yet bears. The marriage of Isabella's daughter Johanna with Philip I, son of the Emperor Maximilian, made Spain a part of the Hapsburg Empire, with Germany, the Netherlands, Milan, Naples, and Sicily, Sardinia, Burgundy, and the colonies, under Charles I of Spain, V of Germany (1516). The despotism of Charles was followed by the tyranny of the bigoted Philip II (1556–98), who, with the aid of the Inquisition, undertook to root out Protestantism, and he with his no less despotic and intolerant successors succeeded in bringing to a close before the eighteenth century the brilliant period of Spanish history. The line of Hapsburg princes closed with Charles II (1665–1700).

On his death followed the War of the Spanish Succession, which resulted in placing a Bourbon on the throne, and with two brief interruptions this dynasty has remained in power. In 1808–14 Joseph was kept in power by his brother Napoleon. This was the period of the Peninsular War, in which successful resistance to the schemes of Napoleon was for the first time offered. Upon the dethronement of their king and the occupation of his throne by Joseph Bonaparte, the Spanish people rose in arms, and, though ill disciplined, showed such vigor and courage as to require the presence of Napoleon to restore French authority. Later he left to his marshals the task of subduing the Spaniards, whose persistent efforts, aided and directed by Wellington, contributed to the final overthrow of Napoleon. The second interruption of the Bourbon rule was 1868–74, during which years a regency, a short-lived monarchy under Amadeus, and a republic were successively established. The Bourbons were restored, December 30, 1874, in the person of Alfonso XII. He died in 1885, and was succeeded by his posthumous son, Alfonso XIII, with Maria Christina, his mother, as regent. A rebellion in Cuba led, in 1898, to war with the U. S., in which the flower of the Spanish navy was destroyed. The death of Alfonso XII in 1885, and the accession in 1886 of his posthumous son, Alfonso XIII, failed to disturb the political conditions. The Carlists, indeed, have been uneasy at certain crises, and the adherents of a republic are not unimportant. Nevertheless, affairs have been in the hands alternately of the Liberals, led by Sagasta, and the Conservatives, led by Cánovas until his assassination by an anarchist in 1897. Spain has in fact had her share of anarchism; she has suffered from labor trouble, and her finances have been on the verge of collapse. Externally, the chief recent event is the loss of the Spanish colonial empire, incident to the Spanish-American War of 1898. See SPANISH-AMERICAN WAR.

Spandau (spăn'dow), an old fortified town and military station; province of Brandenburg, Prussia; at the confluence of the Havel and the Spree, 9 m. WNW. of Berlin (see map of German Empire, ref. 3–G). The citadel stands on an island in the Havel, and is used by the Prussian Govt. as a prison for military and political criminals. The city is well built, has manufactures of hosiery, woolen fabrics, gunpowder, and arms, and carries on a large transit trade between Berlin and Hamburg. Pop. (1905) 70,295.

Spaniel (spăn'yĕl), *Canis extrarius*, a variety of hunting dog; in form a small setter, with silky hair, long in some parts of the body, and long, soft, pendulous ears. It probably originated in Spain. The colors are various, black, brown, pied, liver colored and white, and black and white. The English breed is considered the best for sportsmen, being strong, with an excellent nose, and fond of the water. The water spaniel differs from the common breed in the eagerness to hunt and swim in water, whence it is used to drive ducks into the nets in decoy ponds. The Alpine or St. Bernard spaniel is the largest and most celebrated of the race, being 2 ft. high at the shoulders, and 5 or 6 ft. from nose to end of tail. This is one of the breeds which search the mountain passes in the vicinity of the *Hospice* of St. Bernard in quest of bewildered or weary travelers. The Newfoundland dog resembles the Alpine spaniels; it is large and has great strength; is gentle, very intelligent, and affectionate; it is an excellent swimmer, the toes being partly webbed. The King Charles spaniel is a small and beautiful breed, prized as a lady's pet, generally black and white, or black and tan colored; the hair is soft and silky, the ears pendulous, the forehead elevated, and the eyes intelligent; the variety prized by Charles I of England was wholly black.

Span'ish Arma'da. See ARMADA, THE SPANISH.

Spanish Fly. See CANTHARIS.

Spanish Grass, another name for ESPARTO (*q.v.*).

Spanish Lan'guage, the national language of Spain and also of some other countries where it has been carried by colonists, as Mexico and the rest of Spanish America. In Spain certain regions are not properly included in the territory of Spanish; thus the dialect of Galicia belongs to Portuguese, and there is a small territory in the N. where the language is Basque, while Catalan is spoken in Catalonia, Valencia, and the Balearic Islands. The number of those whose native tongue is Spanish in some form or other is estimated at from eleven to fourteen millions. Noteworthy is the almost total lack of doubled consonants in Spanish words. The orthography, as regulated by the Academy, is a fairly good representation of the spoken language. The pronunciation of modern Spanish is not the same as that of the older language, in which some sibilant sounds existed which have been lost. Thus *x* formerly had in popular words the sound of *sh* in English *she*, but this has become the aspiration written *j* or *g*; compare *Quijote*, formerly *Quixote*, with the French form *Quichotte*, or English *sherry*—that is, wine of Xerez (now written *Jerez*). An initial *h*, now silent, often stands for older *f*.

The grammatical structure of the language is similar to that of other Romance languages. Certain neuter uses, especially of the neuter form (*lo*) of the article with adjectives, are noteworthy; so, too, are the frequent use of a preposition (*á*, "to") before the direct object of a verb, the distinction between the two words *ser* and *estar*, "to be," and that between *haber* and *tener*, "to have." Among the sources of the Spanish vocabulary, besides Latin, Greek, and old Germanic dialects (Gothic), should be noticed especially the Arabic.

Spanish Mack'erel, (1) along the E. coast of N. America, *Scomberomorus maculatus*, a very slender, compressed fish, bluish-green above, satinlike white below, with yellowish spots on the back and sides; it attains a length of 2½ ft.; it is a native of the tropical seas, but ranges from S. Brazil to Cape Cod, and is one of the most esteemed of salt-water fishes. (2) In Europe, *Scomber colias*, distinguished externally from the common mackerel (*S. scombrus*) by the larger eye and the diminished number of wavy streaks; it is known in the U. S. as the chub mackerel and the thimble eye.

Spanish Main, an old term still used for those portions of S. and Central America which border on the Caribbean Sea, *i.e.*, Venezuela, Colombia, and the Central American states. The original Spanish term, *Tierra Firme*, included only the coasts from the mouth of the Orinoco to Costa Rica. Some writers erroneously use the name for the Caribbean Sea.

Spanish-Amer'ican War, a war between Spain and the United States, caused by the condition of affairs in Cuba. Centuries of misrule had culminated in such anarchy that interference on the part of the U. S. seemed to be called for. In the nineteenth century as many as ten organized efforts had been made to throw off the Spanish yoke in Cuba, the most energetic extending from 1868 to 1878, when the island was desolated and impoverished by a ten years' war, When, at length, it was over, the Spanish Govt. caused new difficulties by undertaking to reimburse itself for the expense of the war by additional taxation. The consequence was an outbreak of an organized revolt in 1895. The authorities at first made little headway against it, and the government at Madrid, concluding that Capt.-gen. Campos, the governor of the island, was too gentle in his methods, superseded him by Gen. Weyler, who as governor of the Philippines had acquired the name of "The Butcher." Weyler's methods in Cuba were energetic and cruel. His plan was to reduce the insurgents by burning the houses and crops, and driving the starving population into villages surrounded with stockades and ditches known as *trochas*.

Appeals from the leaders, however, found their way into the U. S., and an organization in New York known as "The Junta" furnished the press with details of the horrors to which Cubans were subjected. Such was the state of Cuban affairs when Senator Proctor, of Vermont, determined to visit Cuba. The result of his visit, as reported in a speech in the Senate, thrilled the nation. The *reconcentrados*, as the people penned within the *trochas* were called, were dying of starvation at an unprecedented rate. In the little city of Santa Clara, with a population of only about 14,000, the number of deaths in 1897 was 6,981, while in the seven years previous to that time the total number of deaths, including the victims of an epidemic of yellow fever, was only 5,489.

It was while such terrible facts were becoming known that the U. S. battleship *Maine* visited Havana, after due consultation with the Spanish minister at Washington, and the vessel was moored in a position assigned by the authorities of the harbor. The ship had been in position less than a month without having left the moorings when, on February 15, 1898, a terrible explosion occurred which destroyed the ship and caused the loss of 266 officers and men. The U. S. appointed a commission to investigate the causes of the explosion, and this commission reported that the ship had been destroyed by a mine exterior to the vessel, and that the concussion had caused two of the magazines also to explode. The publication of this report caused all the slumbering fires of indignation in the country to burst out into flame.

Pres. McKinley had personally learned the horrors of war, and was determined that every resource of diplomacy should be exhausted to secure the desired result without an appeal to arms. On his request, Weyler was recalled, but the changes made by the new captain general were not enough to satisfy the country. Accordingly, on March 8th, McKinley asked for an appropriation of $50,000,000 for national defenses, and Congress granted the appropriation without a dissenting vote. The coast defenses were at once strengthened, vessels and naval supplies were purchased. Congress declared war April 19th, the anniversary of the battles of Lexington and Concord. The President called for 200,000 volunteers and an increase of the regular army from 27,000 to 50,000.

The first great event of the war was in the Far East, The Pacific fleet, under Commodore George Dewey was ordered to proceed to the Philippine Islands and capture or destroy the Spanish fleet. The squadron arrived off Manila Bay on the evening of April 30th. Besides strong fortifications at the mouth of the bay, there was a fort with its arsenal at Cavité, and there were numerous submerged torpedoes in the channel. The two fleets consisted of about the same number of cruisers, but the Spaniards had the advantage of a larger number of small craft, including torpedo boats. At daybreak the ships had reached Manila, a point nearly 30 m. from the mouth of the bay.

The Spaniards fought with the utmost desperation, and it was not till all their ships had been sunk or were on fire and the arsenal at Cavité had been exploded that the white flag was raised over the fort. The number of Spanish casualties has not been reported, but on the American fleet not a man was killed, and only seven were slightly wounded. With the Spanish fleet destroyed, Manila was easily taken, and the entire group of some 1,200 islands soon fell under U. S. control.

As soon as the war broke out the President ordered the fleet at Key West to blockade the ports of N. Cuba. On June 14th, therefore, Gen. Shafter, in command of the military expedition against Santiago, set out from Key West with 16,000 men on board thirty-five transports, under the protection of fourteen armed vessels of the navy, and after six days they arrived off Morro Castle, and landed at Daiquiri, 15 m. E. of Santiago. The first engagement was at Guasimas, two days after landing, where the Spaniards were vigorously driven back, chiefly by the First U. S. Volunteer Cavalry, commonly known as the Rough Riders, under Col. Wood and Lieut.-col. Roosevelt. A general advance was ordered for June 30th. Gen. Lawton's division carried El Caney July 1st, and this was succeeded by the storming of San Juan under Gen. Kent and Gen. Wheeler. The Americans killed numbered 230; the wounded, 1,284. On the evening of July 1st the American lines were within 5 m. of the city.

When it became evident that the city must be taken, the Spanish Govt. ordered Admiral Cervera to attempt an escape. At about 10 A.M. the first of the Spanish fleet, quickly followed by the others, appeared in the mouth of the harbor. As the Spanish fleet, on emerging from the bay, turned westward to escape, they were subjected to a terrific fire from the American battleships and cruisers. Soon all the Spanish vessels were captured or on fire.

As soon as it became certain that the surrender of Santiago was assured, Gen. Nelson A. Miles organized a force to take possession of the island of Porto Rico. His force landed at Ponce, on the S. side of the island, and met with very little resistance.

Soon after the destruction of Cervera's fleet the French minister at Washington presented a note in behalf of Spain, asking the terms on which the U. S. would make peace. Pres. McKinley issued a proclamation suspending hostilities. Spain was to abandon all right to Cuba; Porto Rico was to be ceded to the U. S.; Spain was to grant to the U. S. one of the Caroline Islands, to be selected by the commission, and the commission in the final treaty was to determine the future status of the Philippines. These conditions were duly amplified in the Treaty of Paris, which was ratified by the U. S. on February 6, 1899, and by Spain on March 17th. The Philippines passed to the U. S. in consideration of the payment of $20,000,000, and the island of Guam was selected as the representative of the Carolines. In the course of the war public opinion had come to favor the accession of Hawaii, very largely for military and naval reasons. As soon as it became probable that the Philippine Islands would be retained by the U. S. it became obvious that there would be many strategic advantages in the possession of the Hawaiian Islands. Accordingly, on the recommendation of the President, Congress adopted a resolution acceding to the petition of the Hawaiian Govt., annexing the islands to the U. S. A precedent for this method of procedure had been furnished at the time of the annexation of Texas.

Unfortunately, war did not close with the signing of the Treaty of Peace. The condition of the Philippines was the cause of not a little anxiety. The natives had been in revolt against the Spanish Govt. when the war broke out, and when Spanish authority was overthrown the party in rebellion was unwilling to yield to the U. S. Aguinaldo, the leader of the revolutionists, insisted upon independence. This the U. S. was not willing to grant, although it gave most formal assurances that the political and civil rights of the natives would be respected. The U. S. could not believe that the Filipinos were fitted for self-government. It was evident that, if abandoned, they would fall into anarchy and under military despotism. But the assurances of Pres. McKinley were not satisfactory to the military dictator, Aguinaldo, and on February 4, 1899, his troops attacked the American lines in the suburbs of Manila. Not till early in 1900 was the organized insurrection broken up, and even after that time fighting was continued by small bands in the more inaccessible parts of the island of Luzon. Aguinaldo was captured March 23, 1901, by Gen. Funston and taken to Manila. On April 2d he took the oath of allegiance to the U. S., and published a proclamation advising his followers to lay down their arms. In the meantime a commission appointed by the U. S. had established local native governments in many places in the islands, and had introduced many needed reforms.

Spanish War of Succes'sion. See SUCCESSION WARS.

Span'worm, or Meas'uring Worm, the larvæ of any geometrid moth; so called from the elevation of its body in locomotion, as if measuring. The canker worm is an example.

Spar, in mineralogy, a term used vaguely for several crystalline minerals of nonmetallic luster and smooth cleavage. See CALCAREOUS SPAR, FELDSPAR, and FLUORSPAR.

Spark, Elec'tric. See ELECTRIC DISCHARGE.

Spar'row, any bird of the family *Fringillidæ*. The term is generally applied to those with a streaked plumage in which some shade of brown predominates. The most familiar is *Passer domesticus*, called in the U. S. English sparrow, from the country whence it was introduced, and more correctly known in Great Britain as the house sparrow. It is too well known to need a description. Its original habitat was the greater part of Europe and temperate Asia and N. Africa. The English sparrow was introduced into the U. S. in the fall of 1850, when Nicolas Pike and other directors of the Brooklyn Institute imported eight pairs. These did not thrive, but others were brought over in 1852 and thereafter, and by the end of 1886 the sparrow had spread over the greater portion of the U. S. E. of the Mississippi and N. of Florida, and extended in the NW. portion of its range into Iowa and Minnesota and beyond the Missouri. It was also abundant about San Francisco, Salt Lake City, and New Orleans. Since then it has steadily spread, but exactly how much territory it covers is not definitely known. The sparrow has also been introduced into Australia, New Zealand, and the Hawaiian Islands, where, as in the U. S., it has become a pest. Evidence is overwhelmingly against the sparrow. It is convicted of being destructive to various crops, of crowding out native birds by eating their food and occupying their nesting places, and also of actually driving them away. It is particularly harmful to grain, grapes, peaches, and pears, while the number of injurious insects destroyed by it is trivial. Its phenomenal increase is due to its fecundity, as a pair of sparrows raise on an average three or four broods a season, and may raise as many as six, each brood numbering four or five.

HOUSE SPARROW.

Spar'row Hawk, any one of several small species of the genus *Falco*. The color of the sexes is very different at all ages, but the old and young of each sex are alike. The common American species is *F.* (*Tinnunculus*) *sparverius*. Its characteristics are the bluish crown, whitish front and conspicuous "mustache" across the cheeks, the white or whitish abdomen; in the male the upper part of the head, as well as wings, is ashy blue or slate colored; in the female the head is bluish above, but the bluish on other parts is replaced by rufous, which is barred by blackish. Its length is about a foot. The species is an inhabitant of N. as well as S. America; the only U. S. form is the typical *Sparverius*, and this is found from the subpolar regions to the Isthmus of Panama. It preys upon small birds as well as mice and reptiles. It may be frequently seen perched on the top of a tree nearly erect and motionless, surveying the country around. It breeds in the N. parts of the U. S., as well as farther N., and selects for its nest a hollow tree, in which it lays five to seven dark cream-colored, nearly spherical

HEAD AND FOOT OF AMERICAN SPARROW HAWK.

eggs. It is one of the most useful of the small hawks, feeding upon insects, and particularly grasshoppers.

Spar'ta, or **Lacedæ'mon,** in antiquity, the capital of Laconia and chief city of the Peloponnesus; on the Eurotas, 20 m. from the sea, in a valley bounded W. and E. by the ranges of Taygetus and Parnon. It was about 6 m. in circumference, and consisted of the originally separate villages, Pitane, Cynosura, Limnæ, and Mesoa. It included several hills, upon the largest of which was the theater, of white marble, the two wings of which, 430 ft. apart, still remain. The private dwellings, including the palace, were simple; but few Greek cities equaled Sparta in the magnificence of its temples and statues. The modern town of Sparta occupies one of the hills in the S. part of the ancient site; pop. 4,000. The nomarch and other officials of Laconia reside here. According to tradition, Lacedæmon, son of Jupiter and Taygete, married Sparta, third in descent from Lelex, king of the Leleges, and gave the name of his wife to the city, and his own name to the people and country. Among the mythical kings is Menelaus. After the Dorian conquest of the Peloponnesus, Sparta fell to the twin sons of Aristodemus, Eurysthenes and Procles, and ever after had two lines of joint kings, the Agid (from Agis, son of Eurysthenes) and Proclid. At first inferior to Argos, Sparta became the chief of the Dorian powers only after the institutions of Lycurgus had made it a nation of soldiers.

The Lycurgan legislation (probably before 820 B.C.) recognized three classes: (1) The Spartans, of Dorian stock, resident in the city, alone eligible to public offices, and all warriors; (2) the Periœci or Laconians, freemen of the neighboring townships, with no political power, devoted to agriculture and industry, and forming bodies of heavy-armed soldiers in war; and (3) the helots, or serfs, bound to the soil, and sometimes employed both in domestic and military service. The most important part of the Lycurgan legislation related to the discipline and education of the citizens. The individual was held to exist exclusively for the state, to which he should devote all his time, property, and energies; and every male child, therefore, was under public inspection from his birth, and was trained to warlike exercises. If weak or deformed, he was exposed to perish; otherwise he was taken at seven years from his mother's care, and educated in the public classes. At thirty the Spartan was allowed to engage in public affairs and to marry, but still continued under public discipline, and was released from military service only in his sixtieth year. Both sexes were subjected to nearly the same rigorous gymnastic training. Under the Lycurgan constitution Sparta began its career of conquest. The first and second Messenian wars (743–723 and 685–668 B.C.) doubled its population and territory. The long struggle between the Spartans and Argives terminated in favor of the former in 547 and 524.

Sparta had now acquired the hegemony of Greece, and at the outbreak of the second Persian War it was by unanimous consent intrusted with the chief command. Leonidas died a glorious death at Thermopylæ (480) and Pausanias won the great battle of Platæa (479). But in 476 the allies, alienated by the arrogance of Pausanias, offered the supremacy to Athens, and the rivalry of these states modified all the history of Greece till the Macedonian era. The Peloponnesian War (431–404) terminated with the conquest of Athens and the restoration of the hegemony to Sparta. The Spartans, who now had a great commander in Agesilaus, exerted unrivaled authority until at the battle of Leuctra (371) they were defeated by the Thebans under Epaminondas, and thenceforward ceased to be a leading state of Greece. In 221 Sparta for the first time fell into the hands of conquerors. In 146 it fell with the rest of Greece under the dominion of Rome.

Spar'tacus, leader in the Servile War (73–71 B.C.); b. in Thrace; was a shepherd and afterwards chief of a gang of robbers, but was captured by the Romans, sold as a slave, and trained as a gladiator. By showing how much better it would be to die in an attempt at freedom than to be butchered in the arena, he formed a conspiracy among the pupils of the schools. Seventy of the conspirators, headed by Spartacus, fought their way out of Capua and took refuge in the crater of Vesuvius. Here they were soon joined by numbers of runaway slaves; Spartacus was chosen leader, and formidable predatory expeditions were undertaken. C. Claudius Pulcher was then sent against them with an army of 3,000 men and blockaded them in the crater, but his force was suddenly attacked in the rear and almost annihilated. After this success the mutiny rapidly grew into a formidable war. The peculiar state of affairs in S. Italy contributed much to this result. The soil was owned or leased in large allotments by the Roman nobles, whose estates were cultivated by a slave population, which lived in an abject condition. Spartacus proclaimed the abolition of slavery, and before long he was at the head of 70,000 men. His plan was to force the passes of the Alps, lead his army out of Italy, and then send every man to his home. With a victorious army of 100,000 he passed by Rome, and penetrated into the regions of the Po, where he was met by two consular armies. He routed them both. Unable to induce his soldiers to follow him out of Italy, he marched S. and went into winter quarters in Thurii. The defection of some of his troops and dissensions in his camp led to his defeat by Crassus. He then tried to cross over to Sicily, but was betrayed by the Cilician pirates who had agreed to transport his forces. A part of his army fell into the hands of Crassus, but Spartacus and the remainder effected their escape. Lucullus was now recalled from the E., Pompey from the W. After new victories, Spartacus went to Brundisium with the purpose of seizing the shipping in the harbor and crossing over to Thrace. Falling in with the army of Crassus, near the source of the river Silarus, he was defeated and slain. The fugitives were hunted down and slaughtered, and the revolt was completely suppressed.

Spasm, sudden and involuntary muscular contraction. Spasm of muscle may result from disturbance of the nerve centers, from peripheral irritation of the affected part, or from irritation of other organs or surfaces reflected from the nerve centers. When spasmodic rigidity is persistent it is termed *tonic* spasm. Such is the period of rigidity at the beginning of the epileptic attack and the prolonged rigidity of tetanus and cerebro-spinal meningitis. When spasm is brief and recurs rapidly, it is termed *clonic* spasm. Such are the intermitting and repeated muscular contractions following the inception of the true epileptic attack, and constituting the more ordinary epileptiform attacks or "fits" of children. The graver spasmodic diseases are true epilepsy; epileptiform attacks from many causes, as indigestion and worms in children, renal disease in adults, and in the course of severe acute diseases, narcotic poisoning, etc.; chorea or St. Vitus's dance, tetanus, hydrophobia. Sneezing and coughing are spasmodic contractions of the respiratory tracts excited by irritation of the mucous membrane. Asthma is spasmodic constriction of many bronchial tubes, producing dyspnœa. Intestinal colic is a condition of painful spasmodic constriction of the intestines, due to cold or bad diet. In invalids painful spasms of various internal and external parts may develop suddenly from unknown or trivial exciting causes. The immediate relief of spasm is secured by antispasmodics, as valerian, musk, camphor; by anæsthetics, narcotics, and sedatives, as potassium bromide, hyoscyamus, belladonna, opium. The permanent cure, when attainable, follows the correction of known causes. See CONVULSION.

Spathe, the single sheathing bract which incloses a cluster of one or more flowers in many species of monocotyledonous plants. Sometimes the inclosed flowers are arranged on a spike of the form called *spadix*, and in numerous palms the spadix is branching, and besides the principal spathe there are numerous secondary ones on the spadix.

Spa'vin, certain swellings upon the hock joint of the horse. In bog spavin the swellings and lameness are due to undue secretion of the lubricating fluid of joints. The treatment is entire rest, with frequent bathing of the parts with cold water, and bandaging, accompanied by firm pressure upon the swelling, by compresses or spring trusses. Bone spavin, or spavin proper, is bony enlargement of the hock joint. It causes lameness, even in the early stages, and an imperfect action of the joint, gradually growing worse until the bones become united and solidified by the mass of fibrous bone which grows over them. The disease is caused by strains, to which the hock is subject.

When taken early, rest and counter irritants will effect a cure; but when a considerable growth of bone has taken place, no absorption can be expected, although setons, iodine blisters, or firing may cause an absorption of the bony excrescence, or even of the contiguous bone to some extent. When the disease is taken early, or his diet otherwise regulated, a spavined horse should be turned out to grass, so that it shall be nutritious, yet cooling and laxative. At the same time the spavin may be bathed for a week daily with salt and vinegar, and then a blistering salve of iodide of mercury rubbed in. Though caused by strains and overwork, spavin is hereditary, and a spavined horse or mare should never be used as a breeder.

Speak'er of the House, the presiding officer of the House of Representatives of the Congress of the U. S., of the lower houses of state legislatures in the U. S., of the British Houses of Parliament, and in legislatures of British colonies. As the representative of the House, the Speaker communicates its resolutions to others and conveys its thanks or censures. In the U. S. House of Representatives the Speaker presides over the deliberations of that body, appoints its committees, supervises its journal, signs its bills, resolutions, etc., and as a member may participate in debate after calling another member to the chair. He is chosen by the House from its own number, and can be removed from office by the House.

Speak'ing Trum'pet, an instrument of wood, metal, or papier-maché, usually in the form of a hollow truncated cone, the mouthpiece being at the smaller end. It is used to intensify the sound of speech and increase its propagation in one direction, as on shipboard, or in giving commands to firemen. The cheaper papier-maché trumpet is also known as a megaphone. When the instrument is used the air in front is acted upon over so wide a surface that it becomes subject to greater compression and rarefaction, by the diminished lateral overflow or inflow. Thus the air retains its vibrations and propagates the sound more effectively.

Spear'mint, a plant, *Mentha viridis*, of the *Labiatæ*, abundant in Europe and the U. S., generally found on moist soil. It is much cultivated for its leaves, which are used in a sauce and as a flavor to beverages. An oil is also distilled from spearmint, and from this an essence is prepared, both of medicinal use. It is a handsome plant, with deep-green leaves, and pale-purple flowers springing from an erect stem, usually 2 ft. in height. See MINT.

Spe'cie Pay'ments, Resump'tion of. During the Civil War the U. S. Govt. issued paper money ("greenbacks"). These greenbacks, which were not redeemable in any other form of money, were made legal tender; in other words, persons were obliged to accept them as the equivalent of money in the ordinary course of business. This paper rapidly depreciated, and before the end of the war a dollar in gold was equivalent to a value of $2.85 in greenbacks. In 1875 Congress passed an act providing for a return to specie payment on the first day of January, 1879; in other words, providing for the redemption of the greenbacks in coin. When the time of resumption arrived, however, there were but a few demands for coin, with which the paper money was already on par.

Spe'cies, in biology, the smallest group recognized in ordinary classification. In general words the members of a species differ only in minor features; they are capable of interbreeding indefinitely, and the characters which separate them from allied forms are practically permanent. But the idea of species belongs rather to metaphysics than to nature, for in the living world sharp distinctions do not exist, and if we take into account extinct forms all so-called species really intergrade. Species are grouped into *genera*; allied genera compose an *order*; and orders are grouped into *classes*.

Specif'ic Grav'ity. See Gravity, Specific.

Specific Heat, the heat capacity of a given mass of a substance compared with the heat capacity of the same mass of water. If a pound of water and a pound of some metal such as lead or mercury be raised the same number of degrees, it is found that it takes a much larger amount of heat to increase the temperature of the water than that of the metal. So we say that water has a great capacity for heat. Indeed, among liquids, water has the largest specific heat, and acts everywhere as an equalizer of temperature. It has such great capacity for heat that it warms up slowly and cools down slowly.

Specific heats are measured by heating the body to a known high temperature and determining the amount of heat in calories which it gives up in falling to a second, lower, known temperature. This quantity, divided by the number of degrees between the lower and the higher temperature and also by the mass of body in grams, gives the mean specific heat for the interval of temperatures used. The most delicate of calorimetric operations is that in which the amount of ice liquefied by the cooling body is indicated by the change of volume which it undergoes.

Table of Specific Heats.

Water	1.000	Platinum	.032
Aluminum	.212	Lead	.032
Iron	.114	Glass	.019
Copper	.093	Sulphur	.203
Tin	.056	Graphite	.218
Silver	.057	Charcoal	.241
Mercury	.033	Ice	.504
Gold	.032	Alcohol	.610

See Heat.

Specific Perform'ance, in the equitable jurisprudence of the U. S. and of England, the species of remedy conferred by courts of equity, in which a party is compelled to perform the very thing which he has undertaken to perform in behalf of the person to whom the undertaking is given. In its broadest sense, the phrase would properly describe all the varieties of equitable relief which consist in procuring a defendant upon whom an obligation rests to do the very specific acts which such obligation requires him to do; but in its technical and more restricted signification it is confined to cases in which the obligation arises out of a contract entered into by the defendant.

The fundamental rule is that a specific performance will not be ordered when the complaining party can obtain adequate relief by a purely legal judgment. If, therefore, the contract vests the plaintiff with property in a chattel, so that he can recover its possession through an action at law, or if by the money recovered he can restore himself to the same position, in contemplation of law, which he would have occupied if the defendant had fulfilled his agreement, he must resort to his legal remedy alone. As an illustration: If the contract relates to ordinary goods and chattels, or to any personal property of marketable value, and contemplates a delivery thereof in any manner or a transfer of title, since sufficient money paid to the injured party will always enable him to procure other articles of a like value to those stipulated for such a pecuniary compensation is deemed an adequate remedy, and a specific performance will be refused. In order that a specific performance may be decreed, such a performance must be reasonably possible by the contracting party, and must be of such a nature that the court can compel the specific performance which it decrees. Thus the agreement of an actor, a singer, a painter, or other artist to employ his talents in a specified manner cannot be specifically enforced. Finally, the agreement and the relations of the parties must be such that a decree of specific performance will be reasonable, just, and equitable.

Spec'tacles, a device for the improvement of defective sight. The invention of spectacles has been ascribed to Alexander da Spina, of Florence, or to Salvinus Armatus (d. 1317); also to Roger Bacon (*q.v.*). It is more probable, however, that the knowledge of them in Europe came through the Saracen Alhazen (d. 1038). The Chinese have for ages employed spectacles, and probably they were known to the ancients. Lenses for spectacles are spherical and cylindrical. In a *spherical lens* the surface on one or both sides is a section of a sphere. Rays of light passing through it are refracted equally in all planes. In a *cylindrical lens* the surface on one side is a section of a cylinder parallel to its axis. Light passing through a cylindrical lens in a plane parallel to its axis is not refracted. At right angles to its axis parallel rays are rendered convergent or divergent according as the cylindrical surface is convex or concave.

Convex spherical lenses ground into spectacles are used (*a*) to correct presbyopia (a diminution of the range of accommodation, interfering with vision of near objects); (*b*) to correct hypermetropia, or far sight (oversight), by increasing the refraction of the eye, so that distant rays instead of coming to a focus behind the retina are accurately focused upon it; (*c*) to supply the loss of refractive power caused by removal of the crystalline lens, *e.g.*, after extraction of cataract; these must be powerful glasses having an optical value of about eleven diopters. *Concave spherical lenses* are used to correct myopia, or short sight, by lessening the refraction of the eye, so that distant rays instead of coming to a focus in front of the retina are focused accurately upon it. *Cylindrical lenses* are used to correct astigmatism, in which the refraction varies in the different meridians of the eye. The cylindrical surfaces may be either concave or convex, according as the faulty meridian is myopic or hypermetropic. *Prismatic glasses* are used to relieve muscular weakness of the eye, because a prism will alter the direction of the ray from the point of fixation, so that it coincides with the visual line of the weaker eye.

If there is a combination of astigmatism and hypermetropia or myopia, *compound lenses* are used. On one face of the glass is ground the spherical curvature (convex or concave, according as there is hypermetropia or myopia), and on the other the cylindric curvature, to neutralize the astigmatism. Lenses are numbered according to one of two systems. In the old system a strong lens of 1-in. focal length is the unit. Lenses weaker than the unit are expressed by fractions; thus a lens of 2 in. focus is expressed as $\frac{1}{2}$, one of 10 in. focus as $\frac{1}{10}$, etc. In the second or new system a weak lens of 1-meter (100 cm.) focus is the unit, and is called a *diopter* (abbreviated D.); a lens twice the strength of the unit is 2 D., and has a focal length of 50 cm. Lenses used to correct optical defects may be mounted in spectacle frames or in eyeglasses. When separate glasses are required for distance and reading they may be combined in one frame by cementing the stronger lens upon the lower portion of the distance glass. These are cemented bifocals or double-focus glasses, and have replaced largely the old Franklin glasses, which were of two pieces divided horizontally and joined by their cut surfaces. Instead of double-focus glasses the reading lens may be added as a separate glass in a hook front.

Spectacles should never be worn unless the eyes have been carefully examined by a competent physician, who then writes the formula from which an optician may grind the proper lenses. Glass used in spectacles should be of the best quality, and have an index of refraction of 1.53. Pebble glass has no special advantages.

Spectacle Snake. See COBRA DE CAPELLO.

Spectrophotom'eter, an instrument for the comparison of any color or wave length from any given source of light with the same color or wave length from a standard source. Various sources of light, such as the sun, the incandescent filament of the glow lamp, and a standard gas flame, have been used as standards with this instrument.

Spec'troscope, any instrument for the production and study of spectra. Spectroscopes designed for the precise determination of wave length are called spectrometers. Spectroscopes may be classified with reference to the nature of the dispersing device, whether prism or grating; or with reference to the dispersing power (high or low); or according to the special purpose to which the instrument is to be put (telespectroscope, microspectroscope, etc.).

The essential parts are the slit and the dispersing device, with the focusing arrangement, and the means of identifying and determining the positions of the various regions of the spectrum. The slit consists of two parallel jaws of metal, accurately worked and adjusted. One or both have freedom of motion in a direction at right angles to the length of the slit (Fig. 1). The two edges should be so true that when brought within a small fraction of a millimeter of one another the aperture will be of uniform width. This aperture when illuminated from behind forms the source of light the image of which, dispersed and focused upon a screen, or within the eyepiece of an observing telescope, is to form the spectrum.

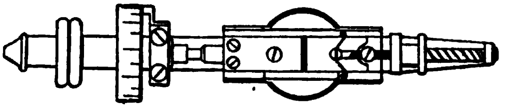


FIG. 1.

The usual material of the prism or dispersing device is glass, although for special purposes rock salt, quartz, fluorspar, carbon bisulphide, etc., are used as different degrees of dispersion of the rays are desired. Whenever high dispersion is desired and a prismatic spectrum is preferred to the normal spectrum produced by means of the diffraction grating, a train of prisms is employed.

Gratings for the production of diffraction spectra are frequently used in the spectroscope instead of prisms. It is used in spectroscopic work (1) whenever a normal spectrum rather than a prismatic spectrum is desired—that is to say, when direct absolute determinations of wave length are to be made; (2) when high dispersion is wanted. Gratings give relatively greater openness in the longer wave lengths and less in the violet and ultraviolet than do prisms. They are objectionable on account of the faintness of the spectra produced, of the overlapping of the spectra, and of the fortuitous and irregular distribution of intensities. For photographic work, however, gratings are advantageous because the strong absorption which violet light suffers in passing through flint glass may be avoided.

Collimator and Observing Telescope.—Spectroscopes of the usual form (Fig. 2) have between the prism or grating and the slit a lens (C), the purpose of which is to bring light to the prism in parallel rays. This lens is attached by means of the connecting tube to the slit at such a distance that the latter is at the principal focus. This arrangement is called the collimator. Beyond the prism the dispersed rays enter the observing telescope (T), which having been focused for parallel light brings the portion of the spectrum under observation to a focus in the eyepiece. Collimator tube and telescope swing upon a common vertical axis at the center of the instrument. By means of the position of the telescope, as indicated upon a divided cir-

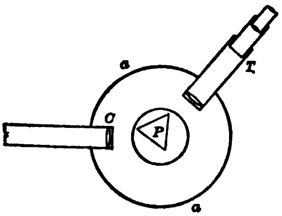


FIG. 2.

cle (*a*), about which it moves, the region of the spectrum which is in coincidence with the cross hairs in the eyepiece is identified.

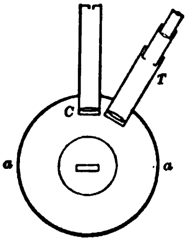


Fig. 3.

Where a grating is used the position of the parts of the spectroscope is that shown in Fig. 3, the telescope being placed on either side of the collimator according as the right-handed or left-handed spectra are to be observed, and at various angles according to the order of the spectrum.

By instrumental developments known as the interferometer and the echelon spectroscope, individual lines of the spectrum have been analyzed and studied. See Spectrum.

Spec'trum, the oblong figure or stripe formed on a wall or screen by a beam of light, as of the sun, received through a narrow slit and passed through a prism, being thus decomposed or separated into its constituent rays. This stripe is colored throughout its length, the colors shading insensibly into one another from red at the one end, through orange, yellow, green, blue, indigo, to violet at the other. These colors are due to the different constituents of which solar light is made up, and the stripe seen is formed by an indefinite number of images of the slit ranged in order and partially overlapping. The analysis or decomposition of the beam is due to the different refrangibilities of the component rays, the violet being the most refrangible and the red the least. Besides the colored rays, the spectrum contains thermal or heating rays, and chemical or actinic rays, which are not visible to the eye. The heating effect of the solar spectrum increases in going from the violet to the red, and still continues to increase for a certain distance beyond the visible spectrum at the red end, while the chemical action is very faint in the red, strong in the blue and violet, and sensible to a considerable distance beyond the violet end. The actinic rays beyond the violet may be rendered visible by throwing them upon a surface treated with some fluorescent substance.

A pure spectrum of solar light is crossed at right angles by numerous dark lines, called Fraunhofer's lines, each dark line being invariable in position. For the proper understanding of the import of these lines, five principles require to be kept in view. First, an incandescent solid or liquid body gives out a continuous spectrum. Second, an incandescent gaseous body gives out a discontinuous spectrum, consisting of bright lines. Third, each element when in the state of an incandescent gas gives out lines peculiar to itself. Fourth, if the light of an incandescent solid or liquid passes through a gaseous body, certain of its rays are absorbed, and black lines in the spectrum indicate the nature of the substance which absorbed the ray. Fifth, each element, when gaseous and incandescent, emits bright rays identical in color and position on the spectrum with those which it absorbs from light transmitted through it. Now, applying these principles to the solar spectrum, we find, from the nature and position of the rays absorbed, that its light passes through hydrogen, potassium, sodium, calcium, barium, magnesium, zinc, iron, chromium, cobalt, nickel, copper, and manganese, all in a state of gas, and constituting part of the solar envelope, whence we conclude that these bodies are present in the substance of the sun itself, from which they have been volatilized by heat.

The moon and planets have spectra like that of the sun, because they shine by its reflected light, while, on the other hand, each fixed star has a spectrum peculiar to itself. It has been already said that the incandescent vapor of each elementary substance has a characteristic spectrum, consisting of fixed lines, which never changes. This furnishes the chemist with a test of an exquisitely delicate nature for the detection of the presence of very minute quantities of elementary bodies. Thus, by heating any substance till it becomes gaseous and incandescent and then taking its spectrum, he is able by the lines to read off, as it were, from the spectrum, the various elements present in the vapor. (See also Light.)

Spectrum Anal'ysis. See Spectroscope and Spectrum.

Spec'ulum, in optics and astronomy, a reflecting surface, usually of an alloy of copper and tin capable of taking a high polish, though the term has also been applied to unsilvered glass since the introduction of silvered-glass telescopes.

Speech. See Language.

Speed'well, a plant of the genus *Veronica* of the *Scrophulariaceæ*. The species are numerous, comprising annual and perennial herbaceous plants and small shrubs, natives of all temperate and cold climates, some of them growing in wet ditches or in marshes, others on the driest soils, but all having beautiful blue, white, or pink flowers.

Speichern (spē'khĕr-ĕn), or **Spichern** (spĭ'khĕrn). See Saarbrücken.

Speke (spēk), **John Hanning,** 1827–64; English explorer; b. Jordans, Somerset; served in India and in the Crimean War; accompanied Capt. R. F. Burton in the expedition which resulted in the discovery of the great lakes of central Africa, and later (with Capt. Grant) discovered the connection of the Nile with those lakes. Capt. Speke published a "Journal of the Discovery of the Source of the Nile" (1863), and "What Led to the Discovery of the Source of the Nile" (1864); and was engaged after his second expedition in a bitter controversy with Capt. Burton as to the merits of their respective discoveries.

Spell'ing Reform'. See Orthography.

Spelt, the *Triticum spelta*, probably the *far* of the ancient Romans and the *zea* of the Greeks; a grain somewhat resembling wheat, but distinct from it. It can be grown on poorer soils than those which are required for wheat. It is much raised in parts of Europe, and

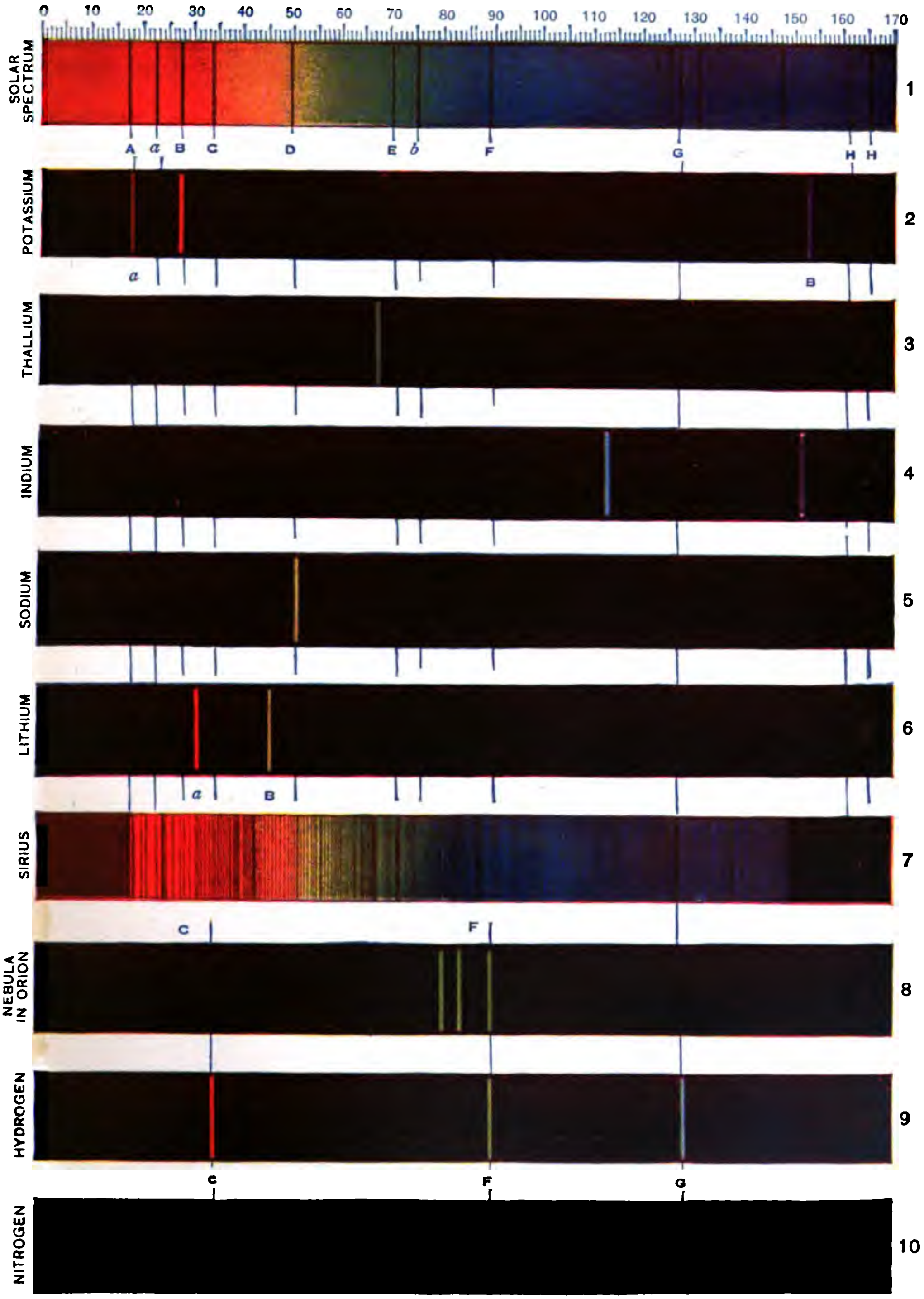


TABLE OF THE SOLAR AND SOME OTHER SPECTRA.

crops of it are occasionally seen in the U. S., as in Virginia. In quality it is much inferior to wheat. *T. bengalense* is raised in India. Lesser spelt, or St. Peter's corn (*T. monococcum*), called also one-grained wheat, is raised to some extent on poor soils in Europe.

Spel'ter, commercial name for pig or block zinc.

Spen'cer, Herbert, 1820-1903; b. Derby, England; was attracted to natural history; devoted himself chiefly to mathematics, and in 1837 began work as a civil engineer. After this he was engaged several years on railroads, but gave his spare time to inventions, scientific experiments, mathematical studies, and to writing for the *Civil Engineer's and Architect's Journal*. In 1842 contributed a series of letters to the *Nonconformist* on "The Proper Sphere of Government"; published his first book, "Social Statics," a treatise on social science based upon the conception of the evolution of society through the operation of natural laws; from 1850-60 published a series of essays, mainly devoted to various subjects of the principle of evolution; wrote, in 1855, "The Principles of Psychology," in which work the doctrine of evolution was applied to the science of mind, and the ground was taken that mental faculties in the whole scale of animal life have been developed by experience, through the intercourse of living organisms with their surroundings, through the principle of heredity and variation, producing slow modifications in vast periods of time.

In 1858 Spencer reached the conclusion that evolution is a universal process dependent upon the laws of matter and force conformed to by all orders of phenomena and capable of being resolved and formulated. Believing that the time had come to attempt a comprehensive scheme of thought from the point of view of modern scientific results, he resolved to undertake it. He began his work by drawing up the prospectus of a "System of Philosophy," involving the full working out of the law of evolution and its application to the phenomena of life, mind, society, and ethics. The Philosophy was divided into two parts: (1) "The Unknowable"; (2) "The Laws of the Knowable." In the first part it is argued that in its knowing the human mind cannot transcend phenomena, but that it cannot escape the consciousness of an Unknowable Power, of which all phenomena are the manifestations, and which human thought can never grasp or understand. The initial treatise, "First Principles," was published 1862; it is occupied with the foundations of his scheme, in which the law of evolution is broadly worked out and formulated in terms of matter, motion, and force. In 1867 he completed the "Principles of Biology," devoted to the data and inductions of biological science from the point of the view of evolution as expounded in "First Principles." In 1872 appeared the "Principles of Psychology," an exposition of mental science grounded in biology and in accordance with the theory of evolution. The fourth division of his system is the "Principles of Sociology," in three volumes and "The Principles of Ethics" occupies two volumes. His "Autobiography" was published in 1904. Mr. Spencer visited the U. S. in 1882.

Spencer, John Charles (third Earl Spencer), better known as LORD ALTHORP, 1782-1845; English statesman; elected to Parliament, 1804; held office under Fox as Junior Lord of the Treasury; sat in Parliament from December, 1806, till the passage of the Reform Bill, 1832, during which period he was one of the leading members of the opposition; especially prominent in attacks upon the financial policy of the Tory administrations; Chancellor of the Exchequer and ministerial leader of the House of Commons in the reform ministry of Earl Grey, 1830-34; succeeded his father as Earl Spencer in November, 1834, and soon afterwards withdrew from active political life; devoted himself to scientific agriculture; was a founder and the first president of the Royal Agricultural Society, 1838.

Spencer, John Poyntz (fifth Earl Spencer), 1835- ; English statesman; entered Parliament, 1857, but succeeded to the peerage in the same year; Lord Lieutenant of Ireland, 1868-74; Lord President of the Council, 1880; again Lord Lieutenant of Ireland, 1882-85; for a second time Lord President of the Council in the Gladstone administration, 1886; First Lord of the Admiralty in the Gladstone government of 1892-95.

Spen'ser, Edmund, 1552-99; English poet; b. E. Smithfield, London. He was educated at Merchant Taylors' School. He entered as a sizar at Pembroke Hall, Cambridge, May 20, 1569, in which month he contributed sonnets and epigrams to "The Theater of Worldlings," a volume printed at London. In 1576 he left Cambridge without a fellowship and visited Lancashire, where he fell in love with a lady supposed to have been Rose Dynley, whose charms he celebrated under the name of *Rosalinde* in a pastoral poem, "The Shephearde's Calendar," published anonymously in 1579, dedicated to Sir Philip Sidney; printed soon afterwards "Three Proper and Wittie Familiar Letters lately passed between two Universitie Men" (1580), being a correspondence with his friend, Gabriel Harvey; obtained in 1580, through the influence of Sidney, the post of secretary to the government under Lord Grey of Wilton, Lord Lieutenant of Ireland; probably resident in Dublin, 1582-88, when he resigned his clerkship of decrees; his services were rewarded in 1589 by a grant from the crown of an estate of 3,028 acres, near Doneraile, county Cork, where he resided, and where he completed his "Faerie Queene"; wrote in 1586 his "Astrophel," a pastoral elegy on the death of Sidney; was in 1588 appointed clerk of the Council of Munster; received in 1589 a memorable visit from Sir Walter Raleigh, to whom he read the first two books of his great poem, which the latter thought "a dish to set before a queen."

Spenser's reception by Elizabeth appears to have been appreciative, for she granted him a pension of £50. In 1590 he also published "Muiopotmos." In 1591 he published "Complaints, containing Sundrie Small Poemes of the World's Vanitie," "The Ruines of Time," "The Teares of the Muses," and "Prosopopoia." His marriage in 1594 inspired his beautiful love sonnets entitled "Amoretti" and a magnificent "Epithalamium" (1595), which were followed by "Colin Clout's Come Home Again." In 1596 he published "The Second Part of the Faerie Queene," "Foure Hymnes," and "A View of the State of Ireland." In 1598, as sheriff of the county of Cork, Spenser incurred the enmity of the insurgents of "the Earl of Tyrone's rebellion," who burned his house and plundered his estate, forcing him to fly to England. Reduced to poverty, Spenser passed a few miserable months in London, and died in Westminster. According to Ben Jonson, he "died for lack of bread," after having refused money sent him by the Earl of Essex. He was buried in Westminster Abbey, near the tomb of Chaucer, as he had desired.

Spermace'ti, Spermaceti-fat, or **Ce'tin,** a substance ($C_{32}H_{64}O_4$) which exists ready formed in the cavities of the head of the sperm whale (*Physeter macrocephalus*), and also in that of some other whales and of *Delphinus edentulus.* It crystallizes out of the sperm oil of the head cavities after the vital heat is lost, forming a magma or mirole, from which in cold weather the sperm oil is expressed by hydraulic pressure ("cold-drawn sperm oil"), the spermaceti being left behind. It is purified by melting it by steam to separate mechanical impurities, and recrystallizing. It then forms a lustrous, pearly white mass of crystalline texture, soft and soapy to the touch; does not grease paper if quite freed from oil. If pure, it is without taste or odor, and has a neutral reaction. It yields by saponification cetyl alcohol and palmitic acid. Spermaceti was formerly much used in the production of sperm candles, which are no longer so common as in the prosperous days of the sperm-whale fisheries, the decline of which dates from the introduction of refined petroleum and paraffin. Spermaceti burns with a bright, clear flame like wax. The standard sperm candle, which is the common unit of comparison for photometric experiments in Great Britain and the U. S., is taken to burn 120 grains of sperm in an hour, which it rarely does with accuracy.

Spermatozo'a, the male reproductive cells of animals, which by union with the female cell (egg) render the latter able to develop. They consist largely of the cell nucleus with the addition of other accessory structures to facilitate the union with the egg (impregnation). In shape they vary greatly, but the most common shape recalls the tadpole. In these forms there is a head, composed of the nucleus, followed by a "middle piece," and this in turn by the tail, which may either be threadlike, or may have an undulatory membrane attached to it. Usually the spermatozoa have the power of motion, by means of the vibrations of the tail, but in some forms they are motionless. Recent investigations show that both nucleus and "middle piece" are concerned in impregnation; the tail and analogous structures play no part after the union.

Spes'sartite. See GARNET.

Spezia (spăt'sē-ä), town; province of Genoa, Italy, 56 m. SE. of Genoa. It has grown rapidly in consequence of the construction of the naval arsenal. The town since 1861 is the chief naval station of Italy, and is defended by formidable batteries; it has extensive shipyards, docks, etc., and manufactures sailcloth, white lead, cables, and leather. It is much frequented as a seaside resort. Pop. (1901) commune, 65,612.

Sphagnum (sfăg'nŭm), a large genus of mosses, many species of which grow in the U. S., mainly in bogs, forming deep, spongy masses, almost always damp. They are called peat mosses, being the principal ingredient in pure peat.

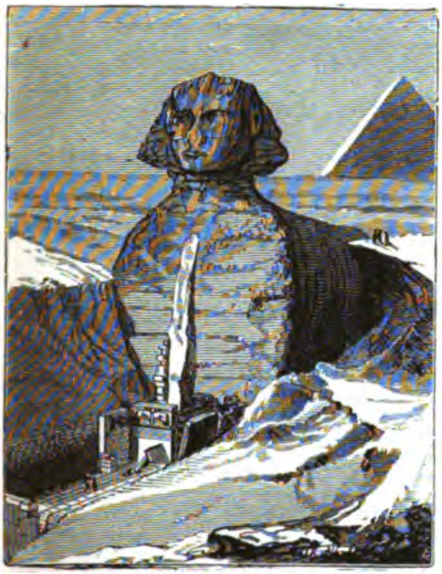
Sphere (sfēr), a surface all of whose points are equally distant from a point within called the *center.* It may be generated by a semicircle revolving about its diameter as an axis. Any line from the center to a point of the surface is a *radius,* and any line drawn through the center and limited by the surface is a *diameter*; all radii of the same sphere are equal; also all diameters of the same sphere are equal. Every plane section of a sphere is a circle; if the plane passes through the center, the section is called a *great circle*; if it does not pass through the center, the section is called a *small circle.* The surface of a sphere is equal to four great circles, or it is equal to the circumference of a great circle multiplied by its diameter. The surface of a zone, *viz.,* the portion of surface included between two parallel planes, is equal to the circumference of a great circle multiplied by the altitude of the zone. The volume of a sphere is equal to its surface multiplied by one third of its radius. The volume of a spherical sector is equal to the zone which forms its base multiplied by one third of the radius of the sphere.

Sphe'roid, a surface generated by an ellipse revolving about one of its principal axes. If the ellipse revolves about its conjugate axis, it generates a surface resembling a flattened sphere called an *oblate* spheroid; if it revolves about its transverse axis, it generates an elongated surface called a *prolate* spheroid. The surface of the earth is approximately an oblate spheroid.

Spherom'eter, an instrument for measuring the radius of a sphere when only a portion of the spherical surface, as, for instance, a lens, is given. The usual form consists of a vertical screw turning in a socket, which is equidistant from three supporting legs with sharp steel points. Above the sockets the screw has a graduated circular head. The points of the legs are brought in contact with the spherical surface, and the screw is turned until its extremity also touches it. This process is repeated with a plane. Thus the distance between the center of the circle through the ends of the legs and its pole on the sphere is obtained, from which the radius of the sphere can be calculated.

Sphinc'ter, in anatomy, a muscle the fibers of which, generally circular, surround some passage in the animal organism, closing the passage, in opposition to certain other muscles called dilators. Some of the sphincters are composed of striped fiber, some of unstriped, and some of both combined. The eyes, pupils, mouth, rectum, vagina, bladder, and urethra are the most important passages which are provided with sphincters; but there are numerous other sets of circular fibers which have more or less of the action of sphincter muscles.

Sphinx (sfĭnks), a fabulous monster of Greek mythology. In the legends of the poets the sphinx is said to have been the daughter of Orthus and Chimæra, or of Typhon and Chimæra, or of Typhon and Echidna, and to have come from the most distant parts of Ethiopia. She was ravaging Thebes and devouring those who could not solve a riddle which she proposed, when Œdipus solved it, upon which the sphinx destroyed herself. (See ŒDIPUS.) Among the Egyptians sphinxes had the head of a man, bearded and capped, and the body of a lion, thus differing from the Greek sphinxes, which had a female head and the body of a winged lion. The great sphinx at the pyramids of Gizeh is near the E. edge of the platform on which they stand, with its head turned toward the Nile. The head measures 28 ft. 6 in. from the top to the chin. The total length of the body, which is that of a lion crouching close to the ground, is 146 ft. Across the shoulders it measures 36 ft., and the paws are extended about 50 ft. Between the paws was built a small temple, which was of masonry, as were the paws, while all the rest of the sphinx seems to be carved out of solid rock.


THE GREAT SPHINX.

The countenance is now so much mutilated (since it was used as an artillery target) that the outline of the features can with difficulty be traced. All but the head and shoulders are buried by desert sand, though it has been uncovered several times by ancient kings and by modern explorers. Its age is unknown; it has been assigned to prehistoric times, to the age of Cheops, and even later, but without proof. It probably represents Ra-Harmachis, the sun god, as guardian of the tombs in the vicinity.

Spice, certain aromatic seeds, barks, roots, dried fruits, etc., used in cookery for their flavoring qualities, and in medicine as stimulants and carminatives. Such are cloves, ginger, allspice, nutmeg, pepper, mace, capsicum, cinnamon, cassia, vanilla, etc. Besides the above, which are exported from tropical countries, and especially from the East, there are others now nearly forgotten, such as cassamuniar, zerumbet, zedoary, culilawan, and the so-called clove bark. These have nearly disappeared from general commerce—some because they are inferior in quality, and others on account of their limited supply. Most of the spices are natives of the Old World, but a few are American, and nearly all the important ones are now generally naturalized throughout the tropical world.

Spice'bush. See FEVER BUSH.

Spice Is'lands. See MOLUCCAS.

Spichern (spĭ'khĕrn), or **Speichern** (spē'khĕr-ĕn). See SAARBRÜCKEN.

Spi'der Crab. See CRAB.

Spiders, an order of arachnid animals, the *Araneida*. The chief characters which distinguish them from other groups are the possession of a body divided into two regions, cephalothorax and abdomen, both without distinct joints, and the latter, which is joined to the former by a slender stalk, bearing spinning mammillæ on the hinder end. The cephalothorax bears four pairs of legs and two pairs of smaller appendages, the first of which are the poison jaws, while the second are curiously modified in the male for reproductive purposes. There are usually eight eyes (sometimes six or fewer) upon the front of the cephalothorax. Respiration is accomplished by lungs or lungs and tracheæ. When lungs alone are present there are two pairs of these organs on the under side of the abdomen. It other forms there is a single pair of lungs, the other pair being replaced by air tubes like those of true insects.

Spiders are carnivorous, and live upon other insects, which they kill by the poison forced through the poison jaws. They do not eat the prey, but merely suck its juices. Some spiders hunt their prey, jumping upon it like a miniature tiger, but the majority form webs of silken threads covered with a viscid substance. The shape and character of these webs vary exceedingly. In general it may be said that the spider has a lair where he can recognize any vibration of the web, and whence he can rush out further to entangle the prey. The web is made from a fluid secreted by glands inside the body, and as it comes in contact with the air in its passage through the spinning organs it hardens into the familiar thread, which in reality is a cable formed of a number of smaller fibers. Besides its use in forming webs the silk is employed in making nests, as a means of flying, and for the formation of cocoons to contain the eggs. The males are smaller than the females, and their approaches to the latter are made with extreme caution, as they run the risk of being devoured; extending their pedipalps, they deposit the spermatophores in the female genital aperture and betake themselves to flight. In their habits spiders are among the most interesting of animals, well repaying observation. Among the largest is the crab spider, measuring 6 or 7 in., and strong enough to prey upon small animals. The bite of the tarantula (*q.v.*) is feared, though usually not fatal.

Spiel'hagen, Friedrich, 1829– ; German novelist; b. Magdeburg; studied jurisprudence, and afterwards philosophy, philology, and literature; taught for some time at the Univ. of Leipzig, and finally devoted himself to literary pursuits; 1859–62, he was literary editor of the *Zeitung für Norddeutschland.* Spielhagen has successfully aspired to treat the great questions of the day in a series of novels distinguished by their artistic composition, elegant style, and philosophic thought. The most important of these novels are "Problematische Naturen," "Durch Nacht zum Licht," "Die von Hohenstein," "In Reih und Glied," "Hammer und Amboss," "Sturmflut," "Quisisana," "Angela," "Was soll das werden," "Noblesse oblige," "Der neue Pharao." In his excellent book, "Beiträge zur Theorie und Technik des Romans," Spielhagen attempts to fix the æsthetic laws which govern the art of novel writing, and in his autobiography, "Finder und Erfinder," he gives a charming account of the influences which conspired to make him a novel writer.

Spike'nard, or Nard, (1) the *Nardostachys jatamansi*, a valerianaceous plant of India. Its strong odor is disagreeable to most Europeans, but it is considered precious in the East. Its medicinal properties are those of valerian. (2) Roots of various species of valerian are exported from Europe to the Levant under the name of Frankish nard, Celtic nard, and mountain nard. Cretan nard is also the root of a valerian. These are used as substitutes for true spikenard. (3) In England the fragrant oil of *Andropogon nardus*, an E. Indian grass, is called oil of spikenard, and used in perfumery. (4) In the U. S. the name spikenard is given to *Aralia racemosa*, and the *A. nudicaulis*, or false sarsaparilla, is called small spikenard.

Spike, Oil of, the volatile oil of the *Lavandula spica*, the broad-leaf lavender of Europe. It has an odor much like turpentine. It is used by artists in preparing varnishes, and by veterinarians.

Spinach, or Spinage (spĭn'āj), the *Spinacia oleracea*, a chenopodiaceous Old World herb, much cultivated in nearly all parts of the world as a pot herb, especially for use in the spring. There are about twenty varieties grown in the U. S. Other plants of this and of other genera having similar uses are locally called by this name.

Spi'nal Caries (kā'rĭ-ēz), **or Pott's Disease' of the Spine,** an inflammatory condition of the vertebræ, destructive in its nature, usually tuberculous, and slow in its course. A slight injury is often sufficient to awaken the process in a predisposed individual. Gradual disintegration of the bodies of one or more vertebræ takes place with subsequent bending, which produces a kyphosis or sharp projection backward. The early symptoms are colicky pains in the abdomen (often mistaken for indigestion), reflex pains in the limbs, and rigidity of the back in walking and stooping. If the disease is situated in the cervical or upper dorsal regions, an irritative cough is often an early symptom.

The treatment consists in keeping the diseased bones perfectly at rest until nature throws a bony bridge across the diseased gap and anchyloses the spine. This result may be accomplished by placing the patient continuously in the recumbent posture, or by the application of a hard leather or rigid jacket, plaster of Paris splint, or other device. The disease is long and tedious, often extending over many years. Abscesses frequently form in the back or groin, more commonly in the latter situation. The latter condition is known as a psoas abscess, from the fact that the pus follows the sheath of the psoas muscle. When the pus seeks exit in the back, the process constitutes a lumbar abscess.

Paralysis of the lower limbs occasionally results, which though tedious is usually curable, provided extension and fixation are rigidly enforced. See CARIES.

Spi'nal Cur'vatures are of three kinds: (1) rachitic, (2) lateral, (3) angular. The curvature of rickets (rachitis) is usually a simple exaggeration of the normal curves of the spine —convexity or kyphosis in the dorsal, and concavity or lordosis in the lumbar region; occasionally there is a lateral bending (scoliosis).

Lateral curvature is a deviation of the spinal column at one or several points from the position which it occupies in health in the median line of the back, accompanied by marked rotation of the bodies of the vertebræ around the axis of the spinal column, which is thus much more distorted in front than behind. It occurs in children; in young, imperfectly developed, feeble, and growing adults, more especially women, and less often in men. Habitual use of one arm to the exclusion of the other may cause deviation of the spine to the stronger side—a common occurrence in weakly children at school, housemaids, etc. Disease of one lung by limiting respiratory movement on one side often causes dorsal curvature to the more active side. Shortening of one limb, hip-joint disease, persistent limping by tilting the pelvis, throws the spine out of center and develops lumbar curvature.

Lateral curvature is often curable by correcting bad habits, as favoring one side in standing, sitting, or sleeping, by resort to light gymnastics and passive movements, and by the use of apparatus which removes weight from the spine and applies pressure or traction to counteract the curves. Great advantage may, in early cases, be derived from lying flat on the back, without a pillow and on a hard mattress, for at least an hour in the mid part of the day. General tonic treatment, cod-liver oil, and phosphates, out-of-door life, warm clothing, stimulating baths, and regulated diet are indicated in all cases.

For angular curvature, see SPINAL CARIES.

Spine, the backbone, the composite bony column of vertebrated animals which affords attachments, direct or indirect, for the ribs and other bony parts, and for numerous muscles. In man it is a flexible column of thirty-three vertebræ united by ligaments, with interposed cartilaginous cushions. The column is from 2 to 2½ ft. in length, and viewed laterally presents marked curves. (Fig. 1.) The column is divided into regions—the *cervical, dorsal, lumbar,* and *pelvic*—corresponding to the neck, chest, abdomen, and pelvis. The vertebræ, excepting in the pelvic region, rotate freely and flex both anteroposteriorly and laterally. A single vertebra (Fig. 2) consists of the *body,* which unites it to other vertebræ, and a bony ring which incloses the vertebral foramen or vertebral canal, protecting the spinal cord; this ring has processes for attachment of ribs, ligaments, and muscles.

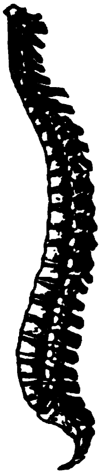


FIG. 1.

The medulla spinalis is that part of the central nervous system which is inclosed in the spinal canal, extending from just below the foramen magnum, at the base of the skull, to a point usually opposite the upper part of the first and second lumbar vertebræ. It is a cylindrical, slightly flattened, cordlike mass of nervous matter, continuous at its upper end with the medulla oblongata, and terminating below in a conical extremity, its entire length being about 18 in. In this course it gives off thirty-one pairs of spinal nerves, by means of which it is placed in communication with the whole of the body below the head. The spinal cord is inclosed by three membranes which lie within the bony canal of the spine —the *dura mater,* the *arachnoid,* and the *pia mater.* The structure and general arrangement of these membranes do not essentially differ from those of the same envelopes around the brain.

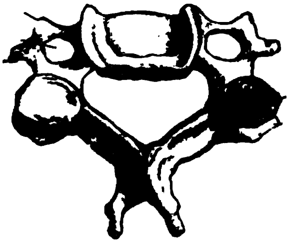


FIG. 2.

The spinal cord itself, like the other nervous centers, consists of certain elementary tissues; these are a supporting basis substance, the *neuroglia,* the connective tissue derived from the pia mater, the nerve cells, the nerve fibers, and the blood vessels. The special grouping of these elements gives form and character to different parts of the spinal cord. In general terms, it may be said that the spinal cord is made up in its central parts of *gray matter—i.e.,* groups of ganglion cells of different sizes, with nerve fibers, blood vessels, and delicate basis substance; and in its outer peripheral parts of *white matter—i.e.,* or less coarse basis substance, supporting medullated nerve fibers and containing blood vessels.

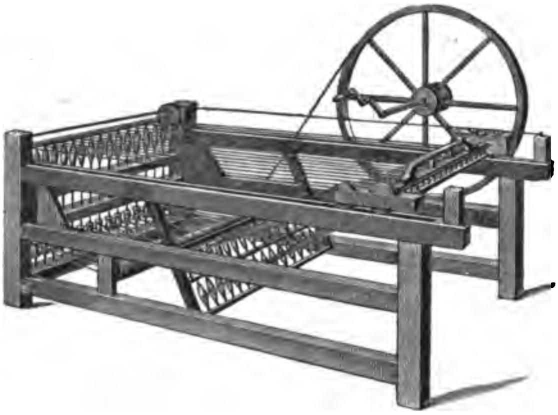
Spin'el, a mineral, essentially a compound of alumina and magnesia, but with variations and admixtures that give rise to a great variety of colors and tints. The transparent spinels make beautiful gems, the finest having often been erroneously sold for true rubies. The pink variety is known as balas ruby or rubicelle, the blue sapphire spinel, the green chlorospinel, the purple almandine spinel. The so-called Black Prince's ruby in the English crown is a spinel. The best spinel gems are from Ceylon, Burma, and Siam.

Spinel'lo di Lu'ca Spinel'li, called SPINELLO ARETINO, abt. 1333–1410; painter; b. Arezzo, Italy. He was the pupil of Jacopo di Casentino, and at the age of twenty surpassed his master. Some scenes from the life of St. Benedict (painted in 1384) by Spinello, at San Miniato, near Florence, are still in good preservation. Before this date he had decorated many churches in his native city; in San Francesco an "Annunciation" still exists in the chapel of St. Michael. He painted a fantastic composition of the archangel driving Lucifer from heaven, a fragment of which fresco is in the National Gallery, London. In 1361 Spinello painted a panel for the abbey of the Camaldolesi, in the Casentino. In 1387 Spinello was invited to Pisa to work in the Campo Santo there, and painted pictures considered his masterpieces, but now nearly destroyed. He left Pisa on account of political disturbances, and after a year in Florence he returned to Arezzo abt. 1394. Here he worked, decorating many churches with frescoes till 1405, when he went to Siena to paint the series of frescoes still preserved in the townhall of that city. The last that is heard of him in Siena is in 1408, after which he returned to his birthplace, where he died.

Spin'et. See HARPSICHORD; PIANOFORTE.

Spin'ning, the art of producing from vegetable or animal fibers an even and compact thread suitable for sewing or weaving. It is one of the most ancient of industries, and is still practiced in many countries by the spindle and distaff in the same manner that the process is pictured on Egyptian monuments. The distaff, held in the left hand, was a simple stick around which the fiber was loosely coiled; the spindle was a species of top which was set in motion by a twirl of the hand, and by combining its rotary motion with a gradual movement away from the spinner, who equalized the size of the fiber by passing it between the finger and thumb of the right hand until the motion of the spindle was exhausted, when the thread was wound around it, and the process was repeated. The first improvement consisted in placing the spindle in a frame and making it revolve in connection with a wheel and treadle. This constituted the spinning wheel, which cannot be traced further back than 1530. Modern invention has added little to this implement, the chief improvement being a bobbin for winding the yarn by a motion separate from that of the spindle.

The spinning jenny was the earliest spinning machine in which more than one thread was spun at a time. Cotton is reduced from the state of the fleecy roll called carding into the state of spun thread by repeated though similar operations. The first draws out the carding and gives it a very slight twist, so as to make it into a loose thread about the thickness of a candle wick, which is called a roving or slubbin. The subsequent processes draw .out the roving much finer, and at length reduce it into yarn. The spinning jenny, invented abt. 1764 by James Hargreaves, was not, like Arkwright's spinning frame (1769), capable of being applied to the preparation of the roving itself. In 1779 Samuel Crompton completed his invention of the mule, which combined in one machine the principles of both the jenny and the frame, and by which the jenny was ultimately superseded. The person operating the jenny turned the wheel with the right hand, and with the left drew out from the slubbin box the rovings, which were twisted by the turn of the wheel. Next a piece of wood, lifted up by the toe, let down a wire, which so pressed out the threads that they wound regularly upon bobbins placed in the spindles. The number of spindles in the jenny was at first eight, but as many as 120 have been used. The introduction of the spinning jenny met with great opposition. In 1779 a mob destroyed the jennies for several miles around Blackburn, and with them all the carding engines, spinning frames, and every machine turned by water or horses. The spinning industry was driven from Blackburn to Manchester and other places. Nevertheless, the jenny and the frame revolutionalized the cotton manufacture.



The Spinning Jenny.

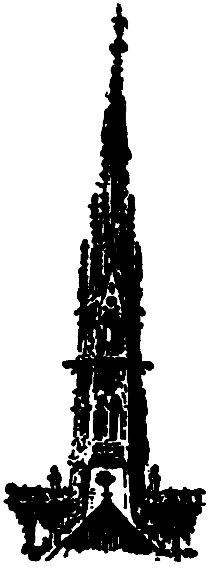
Spinning Wheel. See Spinning.

Spinola (spē′nō-lä), **Ambrosio** (Marquis de), abt. 1571–1630; soldier in the service of Spain; b. Genoa, Italy; took service under his brother, an admiral in the Spanish navy; participated in the war against the Dutch and English, 1588; raised at his own expense in Spain a corps of veterans, at whose head he proceeded to the Spanish Netherlands, 1602; rescued the Archduke Albert from the superior forces of Prince Maurice of Nassau; became chief commander of the Spanish armies in Flanders, 1603; and took command of the forces around Ostend, which had been besieged for two years. The city capitulated, September, 1604. He conducted the war with great ability, but varying success, until the truce of twelve years (1609), which he favored; commanded the Spanish forces in Germany; took Aix-la-Chapelle, Wesel, and Jülich, 1622; was repulsed from Bergen-op-Zoom, 1623; captured Breda after a protracted siege, 1625; was later commander of the Spanish army in Italy, and captured the city of Casale, Piedmont, but died while pressing the siege of the citadel. His death is said to have been hastened by his chagrin at the ingratitude of the Spanish Govt. in disregarding his pecuniary claims.

Spino'za, Baruch or **Benedict,** 1632–77; Dutch philosopher; b. Amsterdam; a member of the Spanish-Portuguese Jewish community at that place, then the chief seat of European Judaism. Becoming a sceptic, he cut loose from Judaism, and unable to accept Christianity, he was left without support. The Jewish God, as the cause and creator of the universe, he had discarded; the Christian conception of God was utterly repugnant to his originally Jewish mind; and thus he had no other recourse left than the so-called pantheism of Substantiality. He was expelled from the synagogue in 1658, and changed his name from Baruch to Benedict Spinoza; and, to avoid persecution, lived in deep seclusion from 1656 to 1661.

In personal appearance Spinoza was of middle height; his features were regular and well formed, complexion dark, hair curly and black, long black eyelashes, and, as Leibnitz remarks, "with somewhat of the Spanish in his face." To earn his livelihood he learned to grind optical glasses, and also the art of painting. His mode of living was extremely frugal and secluded. He never married. The ground of the extraordinary interest taken in Spinoza is to be found in the pantheistic view of the universe which he has carried out in the completest of extant forms in his "Ethics." Hence none of the other works of Spinoza claim special notice. In his scheme there were no God, no Freedom, no Immortality.

Spire, term specifically applied to the tapering portion of a steeple rising above the tower, but sometimes loosely applied to the steeple itself. The earliest spires, in the architectural sense, were merely pyramidal or conical roofs, specimens of which still exist in Norman buildings. These roofs, becoming gradually elongated and more and more acute, resulted at length in the elegant tapering spire. The spires of mediæval architecture (to which alone the term is appropriate) are generally square, octagonal, or circular in plan; they are sometimes solid, more frequently hollow, and are variously ornamented with bands encircling them, with panels more or less enriched, and with spire lights, which are of infinite variety. Their angles are sometimes crocketed, and they are almost invariably terminated by a finial. The term spire is sometimes restricted to signify such tapering buildings, crowning towers or turrets, as have parapets at their base.



SPIRE.

Spir'its. See GHOSTS.

Spirit Duck, a common N. American duck (*Charitonetta albeola*). The male has the head very puffy and iridescent, hence the name bufflehead. It is an expert diver.

Spirit Plant. See HOLY GHOST FLOWER.

Spir'itualism, the creed of those who believe in the communication of the spirits of the dead with the living, usually through the agency of persons called mediums, and also in certain physical phenomena, transcending natural laws, believed to accompany frequently such spiritual communication, and attributed either to the direct action of spirits or to some force developed by the medium's personality.

The elements of the spiritualistic creed are not new, but are traceable severally to a high antiquity among different races and in widely separated localities, and have usually been associated with some form of religion; they have been revived, though not of conscious purpose, and gathered into one body of beliefs as the result of certain incidents which took place at Hydesville, N. Y., in 1848. In March, 1848, rapping sounds were heard, apparently proceeding from various parts of a house in Hydesville, belonging to a family named Voss (anglicized into Fox). These sounds were always perceived in the presence of one or both of the young daughters of Mr. Fox, and a code of communication was established by which conversation was carried on. In 1888 Mrs. Kane (Margaretta Fox) confessed that she and her sister had made the sounds with their toes; but before her death she repudiated this confession.

The Hydesville phenomena led to the formation of numerous circles, where rappings of a similar kind were produced, and supposed communication with the spirits of the dead was established. To the spirit rappings were added other phenomena, such as table turning, automatic writing, trance speaking, etc.; and the persons who developed them received the name of mediums. The first medium, after the Fox sisters, was Andrew Jackson Davis, who attracted notice in 1845 as a clairvoyant and later as a trance speaker. In 1855 the celebrated Daniel D. Home went to England, and later to the Continent. With Home spiritualism reached its highest development, and private and professional séances were established in almost every European town. Home overshadowed all contemporary mediums, and gained adherents to spiritualism from every intellectual and social class. He was equally successful in receiving spiritual communications and in producing physical phenomena, which were often severely tested. Notable experiments in testing Home's powers were made by William Crookes, by means of apparatus of his own construction.

Some years later Slade, and also Eglinton, attracted much attention in Europe by so-called psychography, or spirit writing (usually on slates). The spiritualists attributed this psychography to the spirits, and the nonspiritualists asserted it to be due to conjuring. One of the most noted mediums in England was the Rev. William Stainton Moses (d. 1892). He claimed to receive communications from spirits, both of those recently departed and of personages belonging to remote generations.

In 1892 a series of sittings under unusually stringent, if not perfect, conditions was held by a committee of Italian savants with a Neapolitan medium, Mme. Eusapia Palladino, with the result that several of this committee were convinced of the supernormal character of the phenomena observed, while the others, if not quite convinced, were unable to offer any satisfactory explanation of what they had seen. The phenomena consisted in alterations in the weight of the medium, raps, moving of furniture, and materialization of hands.

Spiritualistic communications or messages are received through the automatic writing with pencil or planchette, or trance speaking of the medium when under spirit control; by direct writing of the spirits on paper or slates with pencil or chalk; by precipitated writing —that is, writing supposed to be produced on paper without visible means; by table turning, either with or without contact of the medium, and interpreted by a conventional code; and by raps on the furniture or walls of a room, made intelligible by a code as in table turning.

The principal so-called physical phenomena of spiritualism are lights, musical sounds, as of invisible instruments played on or playing of real instruments by invisible or materialized hands; moving of furniture and other heavy objects; the passage of matter through matter, as bringing flowers or other material objects into closed rooms; materializations of hands or other parts of the body or of complete human figures; spirit photography; and, finally, phenomena immediately affecting the medium, such as levitation or floating in the air without visible support, the elongation or shortening of his body, and fire tests, when the medium handles live coals and gives them to others to handle without injury, phenomena for which Home was especially renowned.

Spiritualists acknowledge that many exposures of fraud in mediums have been made. They assert, however, that such fraud is to be expected occasionally in professional mediums, since their living depends upon the production of phenomena, and the necessary power is very uncertain. They also say that the trickery is generally of a rather simple kind, and that the genuine phenomena are unmistakable, and not to be so explained, and that therefore occasional trickery does not necessarily prove habitual bad faith on the part of a medium. In 1908 there were 437 spiritualistic organizations in the U. S., with 75,000 members.

Spit'head, a roadstead off Portsmouth, England, the E. portion of the sea channel separating the Isle of Wight from the English mainland. Its security as an anchorage, being protected from all winds except those from the SE., its contiguity to the naval establishment at Portsmouth, and its proximity to the coasts of the Continent, make it a favorite rendezvous of the British navy. Spithead has been strongly fortified since 1864.

Spitzberg'en, Arctic archipelago, 400 m. N. of North Cape of Norway; consisting of W. Spitzbergen, Northeast Land, Stans Foreland, King Charles Land, Prince Charles Foreland, and many smaller islands; area, 27,000 sq. m., with no permanent inhabitants, and not claimed by any country. The islands are mountainous, and mostly covered with snow and ice. Only along the shore are found patches of land, where during the two summer months, when the thermometer rises 10° F. above the freezing point, the snow melts and a few herbs appear. The mountains contain granite, marble, and coal. Bears, reindeer, and foxes are found, and innumerable whales, seals, and sea fowl gather along the shores. The islands were discovered in 1553, and visited in 1596 by the Dutch navigator Barentz while seeking a NE. passage to India. The group forms occasionally the base of operations for Arctic expeditions.

Spitz Dog, the Pomeranian dog, a small variety thought to be a cross between the Arctic wolf dogs and the Arctic fox, like the Eskimo, Siberian, and Iceland dogs, to which, though much smaller, it has a marked resemblance. It is characterized by short and erect ears, a pointed muzzle, a curved bushy tail, and long hair, usually pure white, but sometimes cream color or even deep black. It is brisk in its movements, useful as a watchdog, somewhat snappish, handsome, quick of apprehension, and a favorite lapdog in the U. S. and Europe.

Spleen, the largest of the ductless glands of the body. In man, it is in the left hypochondriac region, beneath the ninth, tenth, and eleventh ribs; its inner surface adjoins the stomach. It is directly related to adjacent viscera by its blood supply, the splenic artery being the largest branch of the cœliac axis. The variable size and gross and minute structure of the spleen indicate that it is a great vascular reservoir. In health it is 5 in. long, 3 to 4 thick, and 1 to 1½ in breadth, and weighs 7 oz.; it is larger immediately after eating, and in malarial and certain other diseases may weigh 15 or 20 lb., and occupy the abdomen down to the pelvic bones. Such enlargement is popularly called the ague cake, rupture of which and consequent death may be caused by slight violence. The substance of the spleen is a soft, pulpy mass of dark, reddish-brown color, consisting of granular matter, red and white blood cells, and the Malpighian corpuscles—masses of lymphoid cells closely packed about the terminal arterioles.

The functions of the spleen are not definitely known, but it is certainly the birthplace of both white and red blood corpuscles. It is active also in the destruction of red corpuscles. It is probably a storehouse for nutritive material, and since in certain diseases, as malaria, plague, etc., the invading organisms are sometimes found in the spleen, though hard to discover elsewhere, it may be that it has a protective function. It is not an indispensable organ, for it has been removed in animals and men with no serious result. The spleen is frequently congested in the course of infectious diseases, such as typhoid fever, malaria, typhus fever, and the like, and is often permanently enlarged by repeated congestions, infiltration, and hypertrophy of its tissue. There may be supernumerary spleens.

Splint, a bony growth, generally upon the inside of the fore leg of the horse, below the knee. In young horses it is usually caused by overwork. Rest, poulticing, and packing with cold, wet compresses are recommended for the early stages. Later, iodine, mercurial ointment, blisters, and the actual cautery may be employed, but not till the inflammation is gone. If the tendons are interfered with, veterinary surgeons sometimes remove the splint.

Splü'gen, mountain pass of the Alps, leading from Switzerland into Italy over an elevation of 6,946 ft. On the Italian side it is covered at many places with galleries of solid masonry to protect travelers from avalanches. These galleries were built by the Austrian Govt., and finished in 1834.

Spoils Sys'tem, in politics, the system of bestowing public offices upon members of the party in power as rewards for political services. See CIVIL SERVICE AND CIVIL SERVICE REFORM.

Spokane' (formerly called SPOKANE FALLS), capital of Spokane Co., Wash., on the Spokane River, and an important railway center of the Pacific coast; about 15 m. W. of the boundary between Washington and Idaho. It is at the falls of Spokane River, and has a picturesque location. The business portion is built about the falls, with broad streets.

Spokane is the seat of a bishopric in the Protestant Episcopal Church, and the Jesuits have three church buildings, several parochial schools, and a college—Gonzaga College. The Jesuit missionaries came to Spokane when it was a mere village, and acquired an extensive tract of land, now within the city limits, by which their college has become well endowed. Spokane has an excellent school system.

In 1900 the city had a property valuation of $19,500,000, and a bonded debt of $1,320,000. The receipts from all sources are about $950,000 per annum, and expenditures something less.

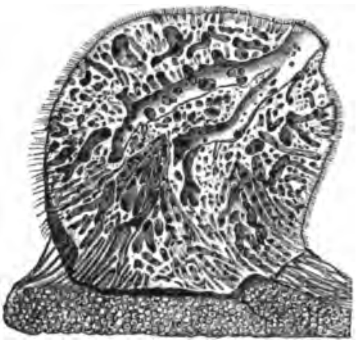
Admirable water power from the Spokane River has made Spokane an important center for manufactures. The output of the flour mills for 1900 was 357,080 barrels. It has a large lumber trade.

In 1879 the site of Spokane was occupied by an Indian trading store and a sawmill. The Northern Pacific Railroad was completed as far as Spokane in 1884, and from that time the place had a rapid growth. It became the chief supply point for numerous mines in Washington, Idaho, and British Columbia, and a rich agricultural region S. and W. In August, 1889, it was almost wholly destroyed by fire. More than $6,000,000 was invested in business blocks within two years. During the same period there was a rapid concentration of railways here. In 1894–95 its citizens gave 1,000 acres adjoining the city to the U. S. Govt. for the establishment of a large military post, Fort Wright. Pop. (1907) est. at 90,000.

Sponge Fish'eries, those industries which consist in the gathering and preparation of the fibrous, horny framework remaining when the fleshy matter has been washed away from one of the *Ceratospongia.* The softness and value of a sponge depend on the firmness and elasticity of the fibers, and their freedom from hard spicules. The best sponges grow in clear, quiet water, 150 to 200 ft. deep. The commercial grades of sponges range in value from twenty-five cents to $50 a lb., the fine Turkey sponges being most expensive. The greater portion and the best qualities of sponges come from the Mediterranean and Adriatic. Some are taken in the Red Sea, and quantities of the coarse kinds come from Florida and the Bahamas.

Sponge fisheries are mostly carried on from small rowboats. The greater portion of the sponges are wrenched from the bottom by a pronged spear; but, owing to the weight of the handle, this implement can be used only in water under 40 ft. deep; beyond that depth divers are employed, or a dredge. In connection with the spear a water glass is used, this being a tube of wood or metal 3 or 4 ft. long, with an end of plain glass. When this is lowered into the water, the bottom can be seen through it plainly. After the sponge has been taken from the sea it is exposed to the air until decomposition sets in, and is then beaten with a stick or trodden under foot in water till the soft parts are removed. In Florida the sponges are put in pens, where the animal matter decomposes, and is washed out by the tide. After cleaning, the sponges are bleached, dried, and baled. The Florida sponge fishery for 1890 amounted to 366,772 lb., worth $438,682. Successful experiments have been made in cultivating sponges. Fresh sponges are cut into pieces an inch square, and the cuttings are skewered on bamboo rods, which are attached to boards and sunk in favorable localities. It requires from three to seven years for a sponge to attain a marketable size.

Spon'ges, the members of the group *Spongida* or *Porifera* of zoölogists. The sponges are animals of uniform structure, although varying greatly in appearance. All over their outer surface are minute openings or pores which communicate with canals, and through these water enters the mass of the sponge. In this the canals branch and supply large numbers of chambers (*ampullæ*), and from these ampullæ the water is collected into excurrent canals and transported through the cloaca to the exterior. In any common sponge the general course of these canals can be traced among the fibers. (See figure.) Nourishment is obtained from minute particles drawn in with the water which is constantly passing through the body. In some sponges no skeleton occurs, but the usual skeletal elements are spicules and fibers, and these are greatly different, both in appearance and in origin, among different sponges.



SECTION OF A SPONGE SHOWING THE CLOACA AND THE CANAL SYSTEM IN OUTLINE.

Spicules are composed of calcium carbonate or silica. Fibers and spicules may occur in the same sponge. The fibers form a continuous network, and consist of a peculiar organic substance, spongin. Sponges are hermaphroditic; the reproductive elements consist of eggs and sperm cells, and it is only after the union of these two that the egg will develop. Among the more interesting forms which occur as fossils and in the deeper parts of the ocean are the "glass-rope sponges" and the beautiful "Venus's flower-basket sponge." A single genus of sponges live in fresh water, and are found in the U. S., especially in the vicinity of Chicago. The decay of these often injures the water supply of cities.

Spon'sors, in general, those who in any way become surety for another; specifically, one who at the baptism of an infant promises in its name that it shall lead a Christian life: a godfather or godmother. The sponsors also bind themselves to see to it that the child shall receive Christian training. Usually, in the Roman Church, there are two sponsors, a man and a woman, and the relation of godfather or godmother and godchild is held to be a real one, precisely as though it were one of consanguinity. The rule of the Church of England calls for three sponsors, two of whom are of the same sex as the godchild, and no impediment to marriage is created by this relation; the present Anglican rule also permits parents to act as sponsors.

Sponta'neous Combus'tion, combustion without the application of heat. Lucifer matches have ignited when exposed to the sun's rays, and phosphorus, when in a dry state, has often taken fire at the touch of the hand, on account of its affinity for oxygen. It is this readiness to combine with oxygen which causes spontaneous combustion in the case of other bodies. Mechanical division increases it greatly, by affording a larger surface to the action of oxygen, and by lessening the conducting powers of the bodies acted on. If the oxides of nickel, cobalt, or iron are reduced by hydrogen below a red heat, the resulting finely divided metals take fire when poured into the air. Freshly burned charcoal is liable to take fire, owing probably to condensation of oxygen in its pores; so it is not ground for making gunpowder until it has been kept for a time. Recently expressed fixed oils absorb oxygen and give out carbon and hydrogen; the temperature of heaps of rags, tow, sawdust, and similar bodies soaked with oil, grease, turpentine, varnishes, etc., will rise on this account, and the low conducting power of such materials helps the process, until very often the mass takes fire. Bituminous coal, especially when containing much pyrites, is liable to spontaneous combustion, when moistened with water. Moisture aids spontaneous combustion also in the cases where fermenting piles of damp hay or freshly mown grass have taken fire. There are a number of alleged cases of spontaneous combustion of the human body, but there is hardly an instance which admits of no other explanation. Liebig considered that the dead body of a fat man, who had been saturated with alcohol, might possibly burn, but that in no circumstances could a body, in which the blood is circulating, take fire. See COMBUSTION.

Spontaneous Genera'tion. See GENERATION, SPONTANEOUS.

Spoon'bill, any one of five or six species of wading birds closely related to the ibises, and remarkable for their spoon-shaped bills. The roseate spoonbill (*Ajaja ajaja*) of tropical and subtropical America is from 30 to 36 in. long; the back, wings, and under parts are of a delicate rose color; the lower neck, smaller wing coverts, and tail coverts of a rich carmine hue; legs darker. The bill and bald head are varied with tints of green, yellow, and black. This bird occurs in the S. of the U. S., but is growing scarcer as it is much sought after. *Platalea leucorodia*, the only species found in Europe, was formerly in some demand for the table. In the U. S. the name spoonbill is often applied to the shoveler. The spoonbill sandpiper is *Eurynorhynchus pygmæus*, of NE. Asia, occurring occasionally in Alaska.

SPOONBILL.

Spoonbill Duck. See SHOVELER.

Sporades (spŏr'ă-dēz), islands in the Grecian Archipelago not included in the Cyclades. More accurately it includes only the islands near the W. coast of Asia Minor between Samos and Rhodes. The more important are Samos, Nicaria, Patmos, Kalymno, Cos, Syme, Telos, Scarpanto, and Rhodes. All belong to Turkey. The cluster of islands N. of Negropont is sometimes called the N. Sporades. Scyros, Scopelos, Sciathos, and Halonnesos are the chief. They belong to Greece.

Spore, in botany, a single cell which becomes free and is capable of developing into a new plant. When it is produced directly or indirectly by an act of fertilization, it is a "sexual spore," while any cell produced by ordinary processes of vegetation, and not directly by a union of sexual elements, which becomes detached for the purpose of direct vegetative propagation, is called an asexual spore. Many kinds of spores are distinguished by botanists.

Sports. See BASEBALL, BASKET BALL, CRICKET, CURLING, FOOTBALL, GOLF, LACROSSE, LAWN TENNIS, ROWING, WRESTLING, YACHTS AND YACHTING, etc.

Sports, Book of, a proclamation by James I of Great Britain, issued in 1618, setting forth certain games which might lawfully be indulged in on Sundays after church service. Among these were "dancing, archery, leaping, vaulting, May games, Whitsun ales, morris dances, and the setting up of Maypoles." It was designed to prevent unlawful interference by Puritanical magistrates with popular recreations. Bear baiting, bull baiting, bowling, and "interludes" were forbidden on Sundays. Charles I reissued the proclamation in 1633. In 1644 the Long Parliament directed that all copies of the "Book of Sports" be burned by the common hangman. The publication of the

"Book of Sports" gave rise to intense excitement, and aroused strong opposition among the Puritans.

Spots'wood, or **Spot'tiswood, John,** 1565–1639; Scottish prelate and historical writer; b. Scotland; educated at Glasgow; chaplain to Scottish ambassador in France, 1601; accompanied James VI to London, and made Archbishop of Glasgow and a member of the Privy Council for Scotland, 1603; Archbishop of St. Andrews and Primate of Scotland, 1615. He crowned Charles I at Holyrood, 1633; in 1625 became Chancellor of Scotland. He drew great obloquy on himself for the part he took in the examination of John Ogilvie, a Jesuit priest who was apprehended at Glasgow and hanged, and in the prosecution of Lord Balmerino, who was condemned to death for the crime of sedition. In 1637 he endeavored to introduce the new liturgy and book of canons into Scotland, urged on by the king and Laud, contrary to his own wish. He was removed from the chancellorship, deposed from his bishopric, and excommunicated, 1638. Wrote "History of the Church of Scotland," 1625. Among his other writings is a Latin treatise, "Refutatio Libelli de Regimine Ecclesiæ Scoticanæ," 1620.

Spottsylva'nia Court'house, Bat'tles at. See WILDERNESS, BATTLES OF THE.

Sprain, or **Subluxa'tion,** a stretching or wrenching of the nonbony parts of a joint, without displacement of the bones, and either with or without tearing of ligaments or tendons. Severe sprains are sometimes as serious as dislocations, especially if the patient attempts to use the part before the inflammation has wholly subsided. Perfect rest, cold or sometimes hot lotions (if the latter be more agreeable), with splints for mechanical support and opiates for the pain, are the treatment.

Sprat, or **Gar'vie,** the *Harengulus sprattus*, a little herring of the European seas. Sprats are spiced, salted, dried, or potted, and are very good when fresh, but are generally eaten only by the poor. The French preserve small sprats, and sell them for sardines. Quantities are also used for fertilizing land.

Spree (sprā), a river of Prussia; rises in Saxony, passes through Berlin, and joins the Havel at Spandau, after a course of 220 m. Leibsch was its former limit of navigation, but it has recently been deepened so as to permit ships to go as far as Berlin. It has canal connection with the Oder.

Spring, the season of the year which follows winter and precedes summer. In the temperate regions of the N. hemisphere it includes, in an indefinite way, February, March, and April (as in Great Britain), or March, April, and May (as in N. America); astronomically, it would extend from March 21st to June 21st. In the temperate regions of the S. hemisphere the spring months are September, October, and November. In the tropical regions there is neither spring nor autumn, but only two seasons, the wet and the dry; in the polar regions, only two seasons, summer and winter.

SPRING, an underground current of water which is fed by rain falling on higher land, and finally rises to the earth's surface. The rain after percolating through the soil gathers as "ground water" above some impervious strata such as clay or rock, and then issues at the base of some hillside as a spring. The water of warm springs usually comes from a great depth, or is heated by coming in contact with lava. Water in percolating through the soil dissolves the soluble salts, and when the amount of these is large, they may form mineral springs of more or less medicinal value. See ARTESIAN WELLS; GEYSERS.

Spring'bok, so called from its habit of leaping when alarmed, a beautiful, active, and graceful antelope of S. Africa, the *Gazella euchore*. It goes in immense herds upon the plains. Its flesh is in some estimation as food, and the hides are much sought for by tanners. This timid creature, when taken in hand young, becomes very tame and sportive.

SPRINGBOK.

Spring'er, a name given by sportsmen to several varieties of the hunting spaniel, used for starting birds from bushy coverts. The Clumber, Sussex, and Norfolk breeds are the best. The springer should weigh from 14 to 40 lb., and should have a good coat, a feathery tail, carried low, and an active, graceful style of work. The Clumber is especially liked, because it gives no tongue while at its duty.

Spring'field, capital of Illinois and of Sangamon Co., 185 m. SW. of Chicago. The city contains 5.84 sq. m. The most conspicuous of the public buildings are the state house, the U. S. courthouse and post office, the county courthouse, the governor's mansion, the state arsenal, the city hall, and the public library. The capitol, completed in 1887, stands in a park of about eight acres. The governor's mansion and grounds occupy an entire block in the S. part of the city. The mansion is a fine and imposing brick structure. The city hall is built of cream-colored brick with stone trimmings.

Among the chief historical attractions of Springfield are the Lincoln residence and the Lincoln national monument. The latter stands in Oak Ridge Cemetery. This mausoleum contains the remains of Pres. Lincoln, his wife, two of his children, and one grandson. In 1900 the monument was taken down and rebuilt upon a foundation extending to the solid rock at the base of Monument Hill. The reconstructed monument is identical in outline with the original except that the shaft is greatly increased in altitude. The Lincoln home is owned by the state, and is maintained as it was when the President's family left it, with as much as possible of the furnishings intact.

The free public library is claimed to be the largest in the U. S. in proportion to the size of the city. In addition, the city has the Illinois State Library, the Illinois State Historical Library, and the Supreme Court Library. Near the city is Camp Lincoln, the permanent training grounds of the Illinois National Guard.

The census of 1900 showed 320 factories (representing sixty-five industries), with capital of $5,030,438, employing 4,106 persons, and turning out products valued at $6,612,286. The principal industries were cars and general shop construction, foundry and machine-shop products, and lumber and planing-mill products. The city is an important coal-mining center, and is surrounded by a rich agricultural region.

Springfield was settled in 1819, and in 1823 became the county seat. It was incorporated as a town, April 2, 1832, and as a city, April 6, 1840. In 1837 it was made the permanent seat of the state government. Pop. (1907) est. at 38,933.

Springfield, county seat of Hampden Co., Mass.; on the Connecticut River. Springfield has forty-six churches, and an elaborate and efficient public-school system. There are also a French-American (Protestant) College and a Bible Normal College.

The city has property valuation of over $72,000,000. The receipts and expenditures are nearly equal, and are more than $2,100,000. The census returns of 1900 showed 817 factories (representing 124 industries), turning out products valued at $21,207,039. The city has extensive factories of cars, arms, cotton and woolen goods, paper, machinery, metals, and chemicals, etc. The U. S. armory employs about 1,000 men and the output of rifles is 1,500 a week.

Springfield was settled in 1636 by emigrants from Roxbury under the leadership of William Pynchon, and was first called Agawam. In 1640 the name was changed to Springfield in compliment to Mr. Pynchon, whose country residence in England bore that name. In 1675, during King Philip's War, the town was burned by the Indians. During Shay's Rebellion in 1787 the U. S. arsenal was attacked, but the insurgents were dispersed by the state militia. Pop. (1906) 75,968.

Springfield, capital of Greene Co., Mo.; 240 m. WSW. of St. Louis. It is on one of the highest plateaus of the Ozark Mountains, 1,450 ft. above sea level; is built in a grove of forest trees with prairies on three sides, and is in an agricultural and lead and zinc mining region. It is the seat of Drury College (Congregational) and a Roman Catholic college. The city has a large jobbing trade, embracing the chief lines of merchandise, and covering principally SW. Missouri and NW. Arkansas. There are railway-car and repair shops, a wagon factory, flour mills, etc. Pop. (1906) est. at 24,119.

Springfield, capital of Clark Co., Ohio; on the Mad River, Lagonda Creek, 80 m. NE. of Cincinnati. It is in an agricultural region, but best known for its manufactures. It is also the seat of Wittenberg College. The manufactures include a great variety of farming implements and machinery, shoes, grave vaults, coffins, and proprietary medicine. One of the great industries of the city is flowering plants, there being eight large establishments that do a mail-order and wholesale business. The city had in 1900 an assessed valuation of $17,894,095. Pop. (1906) est. at 42,069.

Spruce, trees of the genus *Picea*, in the U. S. especially *P. nigra*, black or double spruce, and *P. alba*, white or single spruce, which both afford useful timber, superior to hemlock, but inferior to the best pine. The Norway spruce, *P. excelsa*, is a noble forest tree of the N. of Europe. The native spruces of the U. S. afford a resinous substance called spruce gum, used as a masticatory. The tops are often brewed to make spruce beer, by adding the essence of spruce to water in which sugar has been dissolved, in the proportion of

NORWAY SPRUCE.

about 4 oz. of essence to 10 lb. of sugar and 10 of water, with half a pint of yeast.

Spur. See ERGOT.

Spurge. See EUPHORBIA.

Spur'geon, Charles Haddon, 1834–92; English preacher and writer; b. Kelvedon, Essex; became usher of a school at Newmarket, but, embracing Baptist views, joined a congregation in Cambridge; became a tract distributor, and at eighteen minister of a small chapel at Waterbeach, where he became noted for his zeal and eloquence. He went to London in 1853, where his audiences were so numerous that the congregation had to remove first to Exeter Hall, and thence to Surrey Hall. In 1861 an immense chapel, called the Tabernacle, was built for him, where he afterwards preached. Nearly 20,000 persons were admitted to his church, and thirty-six other chapels were opened in London, the ministers of which were trained at a college founded and directed by him. His sermons were printed weekly, and from them thirty-seven volumes were made up. He also published "The Saint and his Saviour," a "Commentary on the Psalms," "John Ploughman's Talk," "Storm Signals," and other works. In 1865 he became editor of a journal, *The Sword and the Trowel.* His son, THOMAS SPURGEON, was elected pastor of the Tabernacle in 1894.

Spurzheim (spôrts'hīm), **Kaspar,** 1776–1832; German phrenologist; b. Longwich, Rhenish Prussia; studied medicine, and became a disciple of Dr. Gall, whom he accompanied on his travels, and assisted in popularizing phrenology by lecturing, newspaper articles, etc. In 1813 he undertook the introduction of the new doctrines in England, where he resided 1814–17, and from 1825–28, and gave very popular lectures; 1817–25, he lived in Paris. In 1832 he removed to the U. S., and had just begun to excite interest when he died in Boston, November 10, 1832. See GALL, F. J.

Spuyten Duyvil (spī'tn dī'vĭl) **Creek,** the channel connecting the Hudson with the Harlem River, forming the N. boundary of Manhattan Island.

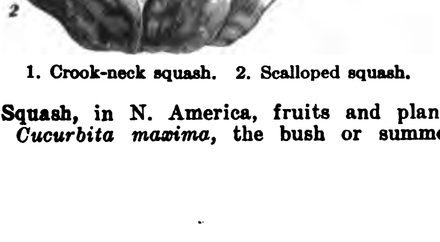
Spy, in the laws of war, a person who goes in disguise or under false pretenses within the lines or territory of a belligerent to observe his strength and obtain information for the purpose of communicating the same to the enemy. A scout differs from a spy in that he retains his character as a soldier, and uses no false pretenses to obtain information. The rules of warfare permit the infliction of the death penalty upon spies taken in disguise within the enemy's lines. The employment of spies, however, is considered a kind of deceit allowable by the rules of war, and, notwithstanding that death is usually inflicted by hanging, men of high honor have often undertaken the office. Two notable instances in history are those of Capt. Nathan Hale and Maj. André during the Revolutionary War.

In the U. S. the instructions for the government of the armies of the U. S. in the field provides that "the spy is punishable with death by hanging by the neck, whether or not he succeed in obtaining the information or in conveying it to the enemy." Exactly what acts shall bring a person within the definition of a spy is not definitely determined, nor when he ceases to be a spy after once having had that character. In the Franco-German War of 1870 the Germans claimed that persons crossing their lines in balloons were spies, but this is not in accordance with present generally accepted opinion. Political spies have been largely employed in Europe, especially in Russia, and in France under Napoleon III. In the U. S. the Secret Service (*q.v.*) of the Treasury Department has been employed for other purposes than the detection of counterfeiters.

Squad'ron, two troops of cavalry; two squadrons form a regiment. A squadron includes from 100 to 200 men. In naval parlance a squadron is a division of a fleet under the command of a junior flag officer, and detached for some particular duty or station, as "the blockading squadron," "the S. Atlantic squadron."

Squalls, bursts of wind, usually of brief duration and accompanied by rain, snow, or hail. One of the commonest of the many causes of squalls is the falling wind which descends on the water from mountainous coasts. On the NW. coast of Lake Superior squalls descend from the bluffs and low mountains only a few hundred feet high, yet with such violence and suddenness in calm, warm weather, and in the heat of the day, that they are dangerous to sailing vessels. In the Aleutian Islands they often descend the mountains behind a head of white woollike fog, and are therefore called "woollies." The white squalls of the tropics on the W. coast of Africa are sudden and furious bursts, whose approach is indicated by an advancing but harmless-looking white cloud.

Squares, Meth'od of Least, a process used to obtain the most probable value of a quantity from a series of observations. In ordinary cases an average is sufficiently accurate; but in scientific work requiring extreme accuracy the rule is that "in treating observations of equal precision the unknown quantities are to be so determined that, after allowing for constant error, the sum of squares of the remaining errors shall be the least possible." This is the "method of least squares."



1. Crook-neck squash. 2. Scalloped squash.

Squash, in N. America, fruits and plants of *Cucurbita maxima,* the bush or summer varieties of *C. pepo*, and also sometimes varieties of *C. moschata.* (See PUMPKIN.) The fruits of *C. maxima* have soft, cylindrical stems which are not inflated at their insertion, the flesh is dry and orange yellow, and the seeds are large and not thin margined. Varieties of this species are Hubbard, Boston, Marrow, the Turbans, Marblehead, etc.

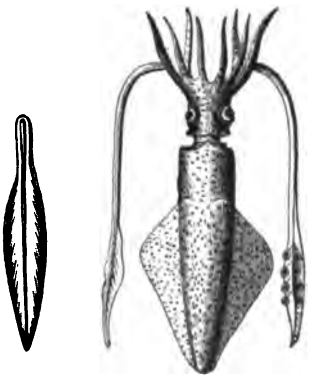
Squash Bug, the *Anasa tristis*, a hemipterous insect, well known for its ravages upon squash and pumpkin vines. It emits a powerful and offensive odor. The striped squash bug is *Diabrotica vittata.* As a rule, these insects are most destructive while the plants are young; and the squash hills should be protected by a frame covered with millinet, or powdered gypsum and shell lime may be freely sprinkled upon the plants, and will be found to impede the destructive work, particularly that of the striped bug.

Squash Fam'ily, the *Cucurbitaceæ.* See GOURD.

Squat'ter Sov'ereignty, or **Pop'ular Sovereignty,** a term used in the political history of the U. S. to deride the principle of leaving to the settlers within the territories of the U. S. the decision of the question whether slavery should be permitted by the constitutions to be adopted when the territories became states.

Squeteague (skwē-tēg'). See WEAKFISH.

Squid, a popular name for many decapod cephalopods, particularly those of the *Teuthidæ* (calamaries), but also extended to the *Sepiidæ* or true cuttlefishes, and even to the poulpes or *Octopodidæ.* The squids proper are found in nearly all seas; they form an important part of the food of many fishes and crustaceans, are extensively used as fish bait, and in many countries are much used as food. (See CEPHALOPODA, CUTTLEFISH, FLYING SQUID, etc.) There are several squids common on the U. S. coasts.



COMMON SQUID OF GREAT BRITAIN.

Squier, Ephraim George, 1821-88; American archæologist. His principal works are "Ancient Monuments of the Mississippi Valley," "The Serpent Symbol," and an important work on Peru, for which he had gathered materials while U. S. commissioner to Peru, 1863-65.

Squill, a drug made from the bulb of *Urginea maritima* (sea onion), a perennial plant of the *Liliaceæ*, growing on the Mediterranean coast. The bulbs are dried and sliced, and offer the varieties known as white and red squill, according to the tint. Squill has little smell, but an acrid, nauseous, bitter taste. It contains much mucilage, but there is uncertainty concerning the active principles, which are probably a resin and a bitter principle. Squill has been known as a medicine from a remote period. It is an acrid irritant, affecting the mucous membranes and glands, and in large dose causes vomiting, purging, strangury, and may even prove fatal. In small doses it produces an increased flow of urine, and also modifies the morbid condition of a mucous membrane affected with catarrh, especially of the bronchiæ.

Squint'ing, or **Strabis'mus,** the condition of vision when the visual axis of one eye is deviated from the point of fixation. The deviation may be inward, convergent strabismus; outward, divergent strabismus; upward or downward, vertical strabismus.

In *paralytic* squint the deviation is caused by a paralysis of one of the muscles of the eyeball. The normal position of the eye and the correct direction of its visual line depend upon the tonicity of the four straight muscles, attached one above, one beneath, and one on each side of the eyeball. If one muscle is paralyzed, the eye is deflected to the opposite side by the stronger or intact muscle. Generally with paralytic squint, in addition to the deviation, there is loss of movement in the direction of the action of the affected muscle. Thus, if the outer straight muscle of the right eye were paralyzed, the affected eye could not move toward the temple on that side, and would be turned inward by the action of the inner straight muscle which is unaffected—that is, there would be a convergent squint. There is also generally double vision, because the images from an object do not fall upon identical points in the two retinas, and hence are no longer fused. Paralytic squint is caused by diseases of the brain, meningitis, and spinal cord, especially locomotor ataxia, certain general diseases like syphilis, rheumatism, diphtheria, diabetes, etc.; poisons, *e.g.*, lead, and injuries.

In *concomitant* squint the deviating eye is able to follow the movements of the other in all directions. It usually appears about the age of four. Far-sightedness is often accompanied by convergent squint, while in near-sightedness there may be divergent squint. Proper glasses may straighten the squint, but if it is persistent it calls for operation, which should not, however, be performed before the sixth or seventh year.

Squir'rel, name properly applicable to the slender arboreal forms constituting the genus *Sciurus* of the family *Sciuridæ.* These are of moderate size or small, have a rather slender head, no cheek pouches, rather long ears, no lateral winglike extension of the skin, and a large bushy tail. The genus grades into *Tamias*, or the chipmunks, and *Spermophilus*, or the ground squirrels. There are about 150 species, and representatives are found in almost every region, Australasia and Polynesia, the S. extremity of S. America, and the W. Indies being the only considerable bodies of land in the temperate or tropical zones destitute of them. In habits the living species are all similar. Most of their life is spent among the trees, and they exhibit great agility in running up the trunks and leaping from branch to branch. Their principal food consists of nuts; they also eat to some extent the larvæ of insects, and attack the nests of birds for their eggs, and even for their young. Their favorite attitude in eating is to sit on their haunches, with their tail thrown upward on the back, and holding the eatables in their paws. In the colder countries they lay up stores of provisions in holes and nooks in or near the trees in which they live. They are mostly readily tamed, and are generally kept in cages with revolving wheels, wherein they exercise.

COMMON GRAY SQUIRREL.

Squirrel, Fly'ing. See FLYING SQUIRREL.

Srinagar, or **Serinagur** (srĕ'nä-gŭr), capital of Kashmir, situated in the beautiful valley of Kashmir, at an elevation of 5,276 ft., and with a mean temperature of 56.8° F.; on the river Jhilam. It is famous for its shawls and attar of roses. The most remarkable building is the palace of the maharajah; it is called the Shergarh (citadel). Close by the city is Lake Dal, which boasts of the far-famed isle Chinars (*Platinus orientalis*). Vegetables are raised here on floating rafts called gardens. Pop. (1901) 122,536, mostly Mohammedans.

Ssuch'uan, formerly SZE-CHUEN, or SSU-CHUEN, largest province of China; area, 220,000 sq. m. It is approached from the E. by the Yang-tse, up which boats of less than seventy tons are dragged slowly, and by the "Great North Road" over the mountains from Si-ngan-foo. Coal is found, but not mined extensively. The making of iron from its ores is general. Salt, from brine raised from wells, is valued at $63,000,000 annually. Petroleum is plentiful. Silk, insect wax, tobacco, and tea are produced. Ch'ung-k'ing is a river port open to foreign trade. Capital, Ching-tu; pop. (1906) 68,724,890.

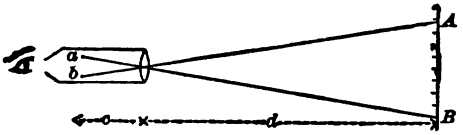
Sta'bat Ma'ter ("the mother was standing"), the first words of a Latin hymn ranked among the seven great hymns of the mediæval Church. It begins:

Stabat Mater dolorosa,	By the cross, sad vigil keeping,
Juxta crucem lacrymosa.	Stood the mournful mother weeping.

As the "Dies Iræ" has been pronounced the greatest, so the "Stabat Mater" is deemed the most pathetic of hymns. Its author is unknown, but it is assigned either to Pope Innocent III (d. 1216) or Jacopone da Todi (d. 1306). The hymn is still in use in the Roman Catholic Church, being sung during the Holy Week and on the festival of the Seven Dolors of the Virgin Mary, and is known to all through the beautiful music of Rossini.

Stabroek (stăb'rŏk). See GEORGETOWN, British Guiana.

Sta'dia Meas'urement, in surveying, a method of determining distances by graduated rods and the cross hairs in the telescope of a transit instrument. The principle of the method is that of similar triangles, shown in the figure, the two hairs *a* and *b* seeming to be projected on the rod at *A* and *B*. Let *c* be the distance from the hairs to the object glass and *d* the distance from the object glass to the rod, then



$$d = \frac{AB}{ab}c = \frac{c}{ab}AB$$

The precision of stadia work is equal to that of ordinary chaining on rough ground. The word "telemeter" is generally employed instead of stadia on the U. S. Coast and Geodetic Survey.

Sta'dium, the principal Greek measure of length for journeys, used in later times also for other linear measurements, especially by the Romans. Its length was fixed by that of the foot-race course (*stadium*) at Olympia, and was 600 Greek = 625 Roman = 606¾ English ft., or one eighth of the Roman mile. Stadium was originally the name of the foot-race course in which running and other athletic exercises took place. Stadia existed at many Greek cities, but the most famous was that of Olympia. The stadium was laid out in two parallel oblong areas, connected at one end by a semicircular tract. The whole was surrounded by seats for spectators.

Stadtholder (stăt′hōld-ėr), a governor of a country or province. In the course of the revolt of the Netherlands against Spain the seven United Provinces chose William, Prince of Orange, as their stadtholder. The title was intentionally a modest one, intimating that the revolt was not against the sovereign, but against the tyranny of his viceroy, the Duke of Alva. It involved the chief civil and military command, and was held with some intermissions by the head of the state until the annexation of Holland by France in 1802. On the restoration of the house of Orange in 1814 the title of king was assumed.

Staël-Holstein (stä-ĕl′-ŏl-stäṅ′), **Anne Louise Germaine Necker de** (Baroness), commonly called MME. DE STAËL, 1766–1817; French authoress. She was the only child of the Finance Minister, Necker. She married in 1786 the Swedish ambassador, Baron de Staël-Holstein (d. 1802), and became the center and oracle of a distinguished society. During the revolution she saved Matthieu de Montmorency and other friends from the guillotine, barely escaped herself, and, 1793–94, resided in London. Under the Directory she was conspicuous as a leader of the constitutional party with Benjamin Constant. She was an enemy of Bonaparte, who compelled her to leave Paris, and she took refuge with Mme. Récamier. She returned to its vicinity, but a work published by her father (1802) became a pretext for her being banished forty leagues from Paris, and she went to Germany. Napoleon persecuted her whenever she left Coppet, and the French edition of her work on Germany was destroyed.

In the spring of 1812 she went to Vienna; and, as she was not safe even there, she went to St. Petersburg, and in 1813 to London. In 1816 she vainly sought to regain her health in Italy. Of her three children by her first husband, Auguste (author of "Lettres sur l'Angleterre") survived her till 1827, and Albertine, wife of the duke, Achille de Broglie, till 1838. The youngest, Albert, was killed in a duel in 1813. She had one child by her second husband, Albert Jean de Rocca, a French officer and military writer (b. 1787, d. 1818), whom she secretly married in 1811, first disclosing the fact in her will. Mme. de Staël was especially celebrated for bold and suggestive generalizations, a masculine grasp of thought, an irrepressible flow of ideas and language, and love of humanity and constitutional liberty after the models of England. Her best-known works are "Delphine," a novel in which she idealizes herself; "Corinne, ou l'Italie," "De l'Allemagne," and "Dix années d'exil."

Staff, the assistants of the general in chief of an army and of his generals, and as commonly used includes (1) the heads of departments (such as artillery and engineers, military law, medical, quartermaster, pay, etc.), (2) the personal staff (including aids, orderly officers, etc.), (3) adjutants, and (4) a special body of officers, intrusted with duties connected directly with military operations, entitled the *general staff*.

The general staff has been universally recognized as an essential part of modern army organization. Its purpose is to convert the ideas of the general commanding into orders, not only by conveying them to the troops, but far more by working out all the necessary matters of detail, and to watch over and preserve the fighting condition and material welfare of the troops.

Staff, an exterior covering for buildings, resembling plaster or stucco, first used at the Paris Exposition of 1889, and employed for most of the buildings and exterior decorative work of the expositions at Chicago and St. Louis. It is made of hydraulic cement, sand, and a binding material of jute fiber. It is cheap and easily molded, but not adapted for permanent structures.

Staf′fa, a small, uninhabited island of Argyle, Scotland; 6 m. W. of Mull; celebrated for its curious caverns, among which FINGAL'S CAVE (*q.v.*) is the most remarkable. Among the other caves are the Cormorant and the Clam Shell. The interior table-land is covered with rich soil and luxuriant grass, which feeds a number of black cattle.

Staf′fordshire, a county of England; area, 1,129 sq. m. The central part is low and undulating, but in the N. and S. the surface becomes hilly. The soil is generally cold, clayey, and not productive. The coal fields are very rich in the N. and S. parts of the county; iron, copper, and lead are found, together with marble, freestone, and an excellent potter's clay. With respect to its manufactures, chiefly china, earthenware, and iron, this county is the third in rank in England. Pop. (1901) 879,625.

Stag, or **Red Deer,** the largest deer of Europe, the *Cervus elaphus*, resembling the American wapiti. The male is called the *hart*, the female the *hind*, and the young the *calf*; the male under three years is called a *brocket*; under four, a *spayad*; under five, a *staggard*;

STAG.

and under six, a *stag*; so that, strictly, a stag is a red deer five years old. At six years he is a *hart of ten*, and when seven years old he is a *hart crowned*, and considered fair game. The stag is distributed over the greater part of Europe, and is found in N. Asia as far as the Lena and Lake Baikal. It inhabits Exmoor, in England, and the Highlands of Scotland. Its horns are lofty and branching. In summer it is yellowish brown; in winter, reddish brown; the color deepens much with age, and in winter the old stags are nearly black. The flesh is inferior to that of the fallow deer.

Stag'beetle, or **Horn'bug,** large beetles of the *Lucanidæ*, remarkable for the great size of the head and large hornlike mandibles. *L. dama* of the U. S. is a well-known inhabitant of decaying wood, piles of chips, etc., and is capable of inflicting a severe bite. *L. cervus* is European.

Stage'coach. See CARRIAGES.

Stag'gers, popular name for several diseases of horses and sheep. Blind staggers in horses is a sort of epilepsy; mad staggers, an inflammation of the brain; grass staggers, an acute and dangerous gastritis. The treatment of the first is by setons about the head, but the disease is incurable. The second is treated by blisters, cathartics, and bleeding. Grass staggers calls for active enemata and full doses of calomel and opium. Staggers in sheep is caused by larvæ of *Œstrus ovis* in the nostrils; they may sometimes be removed by throwing into the nostrils snuff mixed with whisky.

Stag'hound, a large, rough-haired dog, much like the greyhound in general build, although heavier. It is strong, swift, and fearless, and the rival of the bloodhound in powers of scent. It is supposed to be a cross breed of the bloodhound and the greyhound, and is used in Europe for hunting the stag, and in the W. U. S. for hunting antelope.

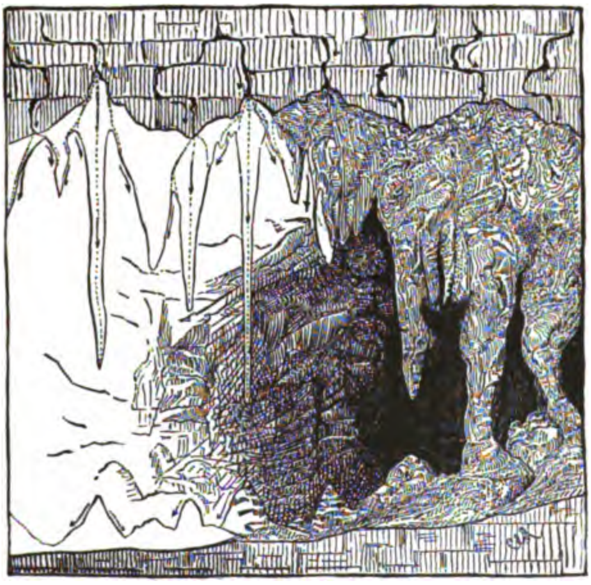
Stag'irite, Ar'istotle the. See ARISTOTLE.

Stained Glass. See GLASS PAINTING.

Stain'er, Sir John, 1840–1901; English composer and organist; b. London; chorister and assistant organist in St. Paul's Cathedral till 1872, then organist till 1888; 1889, Prof. of Music, Oxford. His compositions were chiefly sacred, and include three sacred cantatas, "The Daughter of Jairus," "St. Mary Magdalene," "The Crucifixion"; the oratorio, "Gideon," an early work; and many anthems and services; also wrote "Music of the Bible" and a "Dictionary of Musical Terms."

Stair, a prominent Scottish family, of which the following are the most eminent members: (1) JAMES DALRYMPLE, Viscount Stair, 1619–95. He was an advocate, and figured in Scotch politics under both Cromwell and Charles II. The latter made him a baronet, and in 1671 he became Lord President of the Court of Session; but, refusing to take the new test oath, he was obliged to resign in 1681. In the latter year appeared his "Institutions of the Law of Scotland," the Scottish Blackstone. He fled from persecution to Holland in 1682, came with the Prince of Orange to England in 1688, and was restored to his former office and raised to the peerage. (2) JOHN DALRYMPLE, Earl of Stair, abt. 1648–1707, son of the preceding, Secretary of State for Scotland. He was pronounced by the Scottish Parliament the original author of the massacre of Glencoe, and censured, but never prosecuted. (3) JOHN DALRYMPLE, Earl of Stair, 1673–1747, son of the preceding. He served with distinction under Marlborough, won the battle of Dettingen, was ambassador to France and Holland, and was made commander in chief in Scotland, and afterwards in Great Britain.

Stalac'tites, iciclelike masses of lime, limonite, chalcedony, pyrites, etc., attached to the roofs of caverns; they are formed by the evaporation of water holding these substances in solution. Stalactites sometimes form columns reaching from floor to roof of high chambers; sometimes they imitate curtains, waterfalls, etc., and constitute notable features, as in the Mammoth Caves (Kentucky) and the Luray Caverns (Virginia). The name *stalagmite* is given to accumulations of material of the same nature as stalactites, but deposited on the floors of caverns. This sometimes forms continuous sheets over the surface, sometimes rises into columns, which join the stalactites above. Stalactites are often tubular, and, indeed, gen-



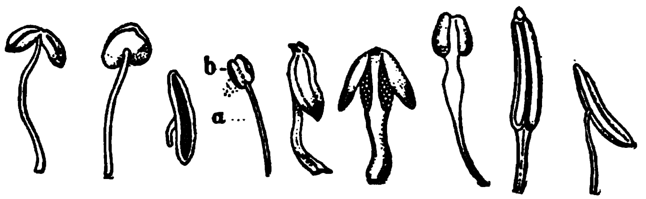
STALACTITES AND STALAGMITES ON ROOF AND FLOOR OF A CAVERN. The arrows show the direction of the moving water.

erally begin to form as tubes, since the solid matter held in solution by a drop of water when precipitated by evaporation forms a ring at the base and outside of the drop.

Stal'warts, a section of the Republican Party that in 1881 opposed the administration of Pres. Garfield. The quarrel arose from the appointment of a collector of the port of New York in opposition to the wishes of Conkling and Platt, the senators from that state. The party was divided into Stalwarts and "Half-breeds," as friends of the administration were called, and this helped the Democrats to win in 1884.

Stamboul (stäm-böl'), the wealthiest, most populous, and important of the divisions of Constantinople, called Istamboul by the Ottomans. Stamboul is a triangular-shaped promontory, projecting E. toward the Bosporus from the mainland, and included between the Golden Horn and Marmora.

Sta'men, the pollen-bearing organ in plants. Morphologically it is a leaf, upon which one or more pollen sacs (spore sacs or sporangia) are produced. On account of its special function it is rarely an expanded structure, although it is so in water lilies, cannas, and some other cases. In its usual form the slender stalk (*filament*) is surmounted by the pollen sac (*anther*), which at maturity contains many loose cells, the pollen.



Forms of Stamens. *a*, filament; *b*, anther.

Stam'ford, town and city, Fairfield Co., Conn., on Long Island Sound and Mill River, 34 m. NE. of New York. It lies in a valley with hills on three sides and the Sound on the S. There are lumber mills, metal and chemical works, stove and range factories, and a variety of other industries. Stamford locks are well known. Stamford was settled in 1642, had its name changed from the Indian Rippowam, 1642. Assessed property valuation, $17,000,000; pop. (1906) est. at 17,599.

Stam'mering, an affection of speech characterized by imperfect coördination of the muscles concerned in articulation. It may be manifested as a difficulty in beginning the enunciation of words, especially words which begin with the "explosive consonants" (*b*, *p*), and which require the sudden opening of the lips. Or the word may be begun, but after the enunciation of a syllable there is a repetition of the same syllable. This is also known as stuttering. Stammering may be acquired by carelessness in speech or by association with others similarly affected, or even by mocking such persons. In most cases it disappears after the attainment of adult age. It is generally increased by emotional disturbance, especially fright, and is often cured, by the patient acquiring confidence, never attempting to speak in a hurry or when the chest is empty of air, or by reading with deliberation. Stammerers never have any difficulty in singing, for they know that a certain definite manner is to be observed, and this gives them confidence. The affection is sometimes permanently removed in time by the patient performing some trifling muscular action as he enunciates the words over which he stumbles. Thus he can sometimes prevent the fault by moving a finger at the very instant that he begins to utter the word.

Stamp Acts, laws requiring that stamps purchased from the government be placed on certain legal documents. In the history of the British colonies in N. America, Stamp Act refers to a law passed by the British Parliament, March 22, 1765, "for granting and applying certain stamp duties and other duties in the British colonies and plantations in America." It took effect from November 1, 1765, but was the occasion of such protests and resistance that it was repealed, March 18, 1766, and a bill of indemnity for those who had incurred penalties was passed, June 6, 1766.

Stamp Mill. See Grinding and Crushing Machinery.

Stamps, official marks set upon things chargeable with some duty or tax, showing that the tax has been paid. These stamps may be either embossed or printed separately and gummed on the back. The British Govt. has long required the use of such stamps on checks, receipts, bank drafts, and legal documents, and during the Civil War and the Spanish-American War the U. S. made similar use of stamps for revenue purposes upon proprietary articles and a variety of other commodities. Internal revenue stamps are used in the U. S. only for tobacco, snuff, cigars, ales, etc., and, since 1894, for playing cards.

Postage stamps are also of two kinds: (1) those that are impressed on envelopes, wrappers, and cards, and (2) adhesive labels. Their use is an evidence of prepayment of postage. Before their introduction it was the custom to take letters to the post office and prepay the postage in cash, the postmaster then stamping such mail matter as prepaid. The first introduction of postage stamps for regular issue took place in Great Britain, May 6, 1840, and was the result of the efforts of Sir Rowland Hill, who had fought for three years in the House of Commons for postal reform. Prior to that time, James Chalmers, of Dundee, Scotland, had invented an adhesive label intended to be used as a postage stamp, but he was unable to introduce his invention. It was in France that the first attempt was made to prepay letters by means of a cover or band at a fixed rate.

In the U. S. the proprietors of local delivery companies began to sell postage stamps to their patrons as early as 1842. The first was the City Dispatch Post, owned by Alexander M. Greig, operating in the city of New York; in August, 1842, he sold the entire outfit to the U. S. Govt., which retained his design for the stamp, a three-quarter-face portrait of Washington, changing the inscription to read "United States City Despatch Post." The government of the U. S. was rather tardy in accepting the new system, and until 1847, when the first stamp for general use was issued, the postal service depended either upon the old cumbersome system or the individual enterprise of the postmasters in various towns, who, on their individual responsibility, had postage stamps printed and sold at their offices. Brazil issued postage stamps in 1843; France, Belgium, and Bavaria followed suit in 1849. Most of the prominent governments in Europe followed in rapid succession, but some were slow in accepting the reform: Spain (1850), Italy (1851), Denmark (1851), Portugal (1853), Norway (1854), Russia (1857), Sweden (1858), Greece (1861), Turkey (1863). All early issues of postage stamps had plain edges, until in 1848 Henry Archer, in London, invented a machine for perforating.

The number of stamps issued by different countries, as well as the extremes, both high and low, of denomination, vary greatly. The U. S. enjoys the distinction of having had in regular use at one time a larger number than any other country. From 1873 to 1884, besides the regular issue for general use of 13 adhesive stamps, 13 envelopes, and 2 wrappers, each department of the government had its own series, with a total of 92 adhesives, 12 envelopes, and 2 wrappers; besides these there were 7 postage due and 24 newspaper and periodical stamps. This does not take into account minor varieties of die or the different colors of paper used for the envelopes. The postage stamps which have the lowest face value are the $\frac{1}{2}$ milesimo stamp of Cuba and Porto Rico and the $\frac{1}{4}$ centimo of Spain, each representing about $\frac{1}{20}$ of a cent. These are used for local newspaper postage. The stamp of largest denomination is the £20 of S. Australia, which is available for both postage and revenue purposes.

An interesting feature of the use of postage stamps is the issue of a special kind of stamps on the occasion of any celebration. The first issue of this description was made in Great Britain in 1887, on the fiftieth anniversary of the accession of Queen Victoria. The example was not followed for some years, but it has become fashionable to make such issues, and among them may be mentioned especially the Columbus issue made by the U. S. in 1893 to celebrate the discovery of America, and similar issues made in the Argentine Republic, Nicaragua, Salvador, Honduras, Venezuela, and Porto Rico in 1892 and 1893. All of these were legitimate issues, made to commemorate an event of real importance, but they have opened the eyes of other governments to the speculative value of such stamps, and 1894 saw a flood of jubilee and commemorative issues. Flagrant examples of such abuse are an issue in the republic of San Marino to commemorate the opening of a new palace, and an issue in Portugal to commemorate the seven hundredth anniversary of the birth of St. Anthony of Padua, both of which are avowedly made solely on account of the profits to be derived from the sale to postage-stamp collectors. Philately, as the study of postage stamps is termed, has its text-books and periodicals, and its devotees are in all countries. Every minute variation of paper, style of printing, perforation, gum, water mark, etc., is considered as marking a different issue, and in some instances as many as fifty distinct variations of a single stamp are collected.

Stand'ards. See BANNER; FLAG.

Standards of Val'ue. See MONETARY STANDARDS.

Stan'dish, Miles, abt. 1584–1656; soldier; b. Lancashire, England; served on the Continent, probably with the English forces; became a captain; settled in Leyden, and accompanied the Pilgrims of the *Mayflower* to New England, 1620; lost his wife, Rose, during the first winter; is said by tradition to have employed his friend, John Alden, to negotiate his marriage with the fair Priscilla Mullins (see Longfellow's "Courtship of Miles Standish"), with the result that Alden married her; rendered important services to the colonists in preserving them from the Indians; visited England as agent for the colony, 1625, returning with supplies, 1626; broke up the settlement at Merry Mount, 1628; was for the remainder of his life either magistrate or a member of the board of assistants to the governor, and took part in the settlement of Bridgewater, 1649. He was of small stature and choleric temper, and possessed great energy and force of will. One of his swords and other relics are preserved in the Pilgrim Hall, Plymouth.

Stan'field, William Clarkson, 1793–1867; English landscape and marine painter; b. Sunderland, Durham. He was a sailor in the British navy, became a scene painter while still a young man, and taking up painting of landscape and naval battle scenes attained success, and was elected a Royal Academician in 1835. Among his most celebrated works are "Battle of Trafalgar" and "Battle of Roveredo."

Stan'ford, Leland, 1824–93; American capitalist and philanthropist; b. Watervliet, N. Y.; admitted to the bar, 1849; removed to Port Washington, Wis., where he practiced law till 1852, when he went to California and engaged in gold mining; settled in San Francisco in 1856, and entered into business. He first appeared in politics as a delegate to the convention at Chicago in 1860 which nominated Lincoln; was elected Governor of California, 1861, and urged the importance of building the Pacific Railroad. He superintended the construction of that part of the road that crossed the mountains, spending personally more than $20,000,000 on a stretch of roadway of 100 m. U. S. Senator, 1885–91. With his wife he founded Leland Stanford Junior Univ.

Stan'hope, Lady Hester Lucy, 1776–1839; b. Chevening, Kent; confidential secretary to her uncle, William Pitt, 1796–1806; received thereafter a pension of £1,200; proceeded in 1810 to Syria; acquired by her magnificent and singular ways of living the veneration of the Arabs, who treated her as a queen; established herself in 1814 in the deserted convent of Mar Elias, upon a crag of Lebanon; became a benefactress to political refugees and to the poor; exerted considerable political influence, and practiced astrology.

Stanhope, Philip Dormer. See CHESTERFIELD.

Stanhope, Philip Henry (fifth Earl Stanhope), better known by his courtesy title, LORD MAHON, 1805–75; English statesman and author; b. Walmer, Kent; elected to Parliament, 1830; Under Secretary of State for Foreign Affairs, 1834; supported the repeal of the Corn Laws; carried the Copyright Act of 1842; defeated at the elections of 1852 for having voted with the protectionists against the modification of the navigation laws; founded the Stanhope prize for the study of modern history at Oxford, 1855; Lord Rector of the Univ. of Aberdeen, 1858. Author of "History of the War of Succession in Spain," "History of England, 1713–83," "The Life of the Right Hon. William Pitt," and a "History of England, Comprising the Reign of Anne, until the Peace of Utrecht."

Stan'islaus Leszczyn'ski, 1677–1766; King of Poland; b. Lemberg, Galicia, of one of the oldest and wealthiest families of the Polish nobility; held a high position at Polish court; won the favor and friendship of Charles XII of Sweden, who, after the defeat of Augustus II of Poland and Saxony, declared the Polish throne vacant, and by his influence Stanislaus was elected King of Poland in 1705. Stanislaus was a noble character, and not without talent as a ruler; but after the disaster of Charles at Poltava, 1709, was compelled to flee from Poland; joined friends at Bender, and, 1714, was made governor of the duchy of Zweibrücken. At the death of Charles, 1718, fled to France. His daughter Marie was married to Louis XV, 1725, and at the death of Augustus II, 1733, he was reëlected King of Poland by French influence. Russia was opposed to his restoration, and the army placed Augustus III on the Polish throne. By the Peace of Vienna, 1735, his family estates were restored; he received the duchy of Lorraine as a pension, and retained the title of King of Poland. He resided at Lunéville or Nancy, where he held a brilliant court, gathered scientific men around him, founded splendid educational institutions, erected magnificent public buildings, and was generally called *Le Bienfaisant*. Wrote "Œuvres du Philosophe Bienfaisant" and "Voix d'un Citoyen," in which he predicts the division of Poland.

Stan'ley, Arthur Penrhyn, 1815–81; English clergyman and author; b. Alderley, Cheshire; was a favorite student of Dr. Thomas Arnold at Rugby, 1829–34 (he was the *Arthur* in "Tom Brown's School Days"); gained a scholarship at Baliol College, Oxford, 1834; took a fellowship at University College, 1838, and was tutor for twelve years, and examiner, 1841; took orders in the Church of England, 1840, affiliating himself with the Broad Church party; preacher to the Univ. of Oxford, 1846–47; Canon of Canterbury, 1851–58; Regius Prof. of Ecclesiastical History, Oxford, 1856–64, and Canon of Christ Church, 1858–64; installed Dean of Westminster, 1864, and Lord Rector of the Univ. of St. Andrews, 1874. He was prominent as a defender of broad-mindedness in the Church of England; cultivated friendly relations with dissenters, and was much more popular with them than in his own church; and was regarded as the representative of the progressive school of British theology. He was a sensitive, highly gifted, poetic, spiritual, pure, and picturesque personality. The chief of his many publications are "The Life and Correspondence of Thomas Arnold," "Sermons and Essays on the Apostolic Age," "The Epistles of St. Paul to the Corinthians," "Historical Memorials of Canterbury Cathedral."

Stanley, Henry Morton, 1841–1904; African explorer; b. near Denbigh, Wales, of humble parentage. He was in the poorhouse until his thirteenth year, then taught school, and later shipped as cabin boy for New Orleans, where he was adopted by a merchant, whose name he assumed instead of his own, which was John Rowlands. His adoptive father having died without a will, and the Civil War breaking out, he enlisted in the Confederate states army; was taken prisoner at Shiloh (1862); volunteered in the U. S. navy, and was made an officer for bravery. After the close of the war he went as a newspaper correspondent to Turkey and Asia Minor, and in 1868 accompanied the British expedition to Abyssinia as correspondent of the New York *Herald*. In October, 1869, being then in Spain, he was sent by the *Herald* to head an expedition to learn the fate of Livingstone, from whom only vague intimations had been heard for two years. He reached Zanzibar in January, 1871, and set out for the interior with 192 men. In November he found Livingstone, who was living near Lake Tanganyika, and furnished him with supplies for further explorations. After having explored the N. portion of the lake, Stanley set out on his return journey in March, 1872, reaching England in July, where he was received with honor, the Royal Geographical Society awarding to him in 1873 its patron's medal. Tidings having been received of the death of Livingstone, Stanley headed an expedition, the cost of which was jointly undertaken by the New York *Herald* and the London *Daily Telegraph*, to explore the lake region of equatorial Africa. Starting with 300 men, after many hardships and severe contests with the natives, he reached Lake Victoria Nyanza, having lost 194 men by death and desertion. He circumnavigated the lake, and found it to be a single large lake, and not, as supposed by Burton and Livingstone, a group of lagoons. He arrived at the mouth of the Kongo River after having explored its whole course; returned to the Kongo in 1879, at the head of a Belgian international expedition, and organized the Kongo Free State; lectured in the

U. S. in December, 1886; returned to Kongo Free State in 1887 with an expedition for the relief of Emin Bey, whom he found on the Albert Nyanza. On the return trip he discovered the Ruwenzori Mountains S. of Albert Nyanza. In 1891 he visited the U. S. and Australia on lecturing tours. In 1895 he was elected to Parliament, and was knighted, 1899. His principal works are "How I Found Livingstone," "Coomassie and Magdala," "Through the Dark Continent," "The Kongo, and the Founding of its Free State," "In Darkest Africa," "My Dark Companions," and "Slavery and the Slave Trade in Africa."

Stan'naries, in general, tin mines, but specially those of Cornwall and Devon, with peculiar laws, usages, and courts of their own.

Stan'nic Ac'id, a hydrate, $SnO(OH)_2$, obtained from stannous oxide.

Stanovoi (stă-nō-voi') **Range,** name given by Pallas to the mountains at the source of the Olekma, but since expanded to embrace the whole Siberian watershed between the Arctic and Pacific drainage systems. It is imperfectly known, but appears to extend NE. from near Urga, in N. central Mongolia, to the Chukchu Peninsula, 2,700 m. A principal range on the W. side is the Yablonoi Khrebet, which borders the plateau of Vitim. The highest point is Mount Sokhondo (lat. 50° N., lon. 110° E.), 9,250 ft.

Stan'ton, Edwin McMasters, 1814-69; American statesman; b. Steubenville, Ohio; admitted to the bar, 1836; settled at Cadiz and afterwards at Steubenville; 1842-45 he was reporter of the Ohio Supreme Court. In 1847 he removed to Pittsburg, Pa. In December, 1860, he was made U. S. Attorney-general, and served to the close of Pres. Buchanan's administration. In January, 1862, he was appointed by Lincoln Secretary of War. The characteristics of Stanton's administration were integrity, energy, determination, singleness of purpose, and capacity to comprehend the magnitude of the Civil War and the labor and cost in blood and treasure involved in suppressing it. His labors were indefatigable, and many of the most important and successful movements of the war were originated by him. He continued as secretary after the succession of Johnson, but supported many measures which were vetoed by the President and reënacted by Congress, including those for the establishment of the Freedmen's Bureau, for protection of civil rights, for admission of Colorado as a state, for organization of governments in insurrectionary states, and for conferring suffrage without regard to color in the District of Columbia. This led the President (from whom the power of removal had been taken by the tenure of office act) to request his resignation. He refused to resign, but gave way under protest to Gen. Grant as secretary *ad interim.* On January 13, 1868, the Senate reinstated him. On February 21st the President appointed Lorenzo Thomas Secretary of War *ad interim.* Stanton refused to vacate, and the impeachment of the President followed. Upon his acquittal, Stanton resigned. A few days before his death he was made an associate justice of the U. S. Supreme Court.

Stanton, Elizabeth (CADY), 1815-1902; woman suffragist; b. Johnstown, N. Y.; educated Johnstown Academy and Mrs. Willard's Seminary at Troy; married, 1840, Henry B. Stanton (author and state senator, d. 1887); accompanied him to the World's Anti-Slavery Convention at London; there met Lucretia Mott; resided in Boston until 1847, when they settled at Seneca Falls, N. Y.; with Lucretia Mott signed the call for the first Woman's Rights Convention, which met at her place of residence, July 19-20, 1848; addressed the New York Legislature, 1854, on the right of suffrage, in 1860 in advocacy of divorce for drunkenness, and in 1867 maintaining that during the revision of the constitution the state was resolved into its original elements, and all the citizens had a right to vote for members of the constitutional convention. Most of the calls and resolutions for conventions, addresses to women, legislatures, and Congress, were from her pen. She was president of the National Woman's Rights Committee, 1855-65, of the Woman's Loyal League, 1863, and of the National Association until she withdrew in 1892; contributed articles to journals and magazines; president of the first International Council of Women, Washington, 1888; joint author of "The History of Woman Suffrage."

Sta'ple, in English history, certain towns which had the royal authority to sell and export goods abroad. While these regular markets were first established for convenience in levying taxes, the monopoly of trade which they afforded was carefully preserved by the local merchants. By extension of the term, staples or staple goods are those commodities which are ordinarily dealt in.

Star Ap'ple Fam'ily, the *Sapotaceæ,* a small family (400 species) of gamopetalous, dicotyledonous shrubs and trees, mostly latex bearing. The flowers are regular and hermaphrodite in the axils of the leaves, and have one or two series of stamens, and a superior two- to five-celled, few-ovuled ovary. They are mainly tropical and subtropical. In the S. U. S. there are nine or ten species, five of which are small trees of the genus *Bumelia.* "Several species of this family are useful to man. The fruits of *Lucuma mammosa,* the marmalade of the W. Indies, are a very agreeable food, as are those of *Achras sapota* (the sapodilla plum) and various species of *Chrysophyllum* (star apples), which are much sought after in the Antilles." Some species of *Bassia,* the butter trees, yield a fatty substance by pressure of the seeds. Gutta-percha is obtained from *Isonandra gutta,* a large tree of the E. Indies, by the evaporation of its milky juice.

Starch, a substance (also called *fecula, amidon,* and *amylum*) of the chemical formula, $C_6H_{10}O_5$ or $C_{12}H_{20}O_{10}$, widely diffused in the vegetable kingdom. There are two other substances found in plants which resemble starch —the inulin, which occurs in the dahlia, dandelion, chicory, mustard seed, etc., and the lichen starch which is found in Iceland moss, and several of the lichen and fucus tribes of plants.

Starch is extracted chiefly from wheat, Indian corn, rice, potatoes, the root of manioc or cassava, *Jatropha manihot* (tapioca), the root of several species of the *Maranta* (arrowroot), and the pith of many palms (sago). Wheat flour contains fifty to eighty per cent of starch. The starch is extracted from the whole wheat by "softening" in cold water and pressing under millstones or rollers, or in bags under water, as long as milky water runs off from it. This liquid, when left to itself, deposits starch containing gluten; the latter, however, dissolves for the most part in the liquid, which turns sour; on decanting this acid liquid, repeatedly stirring up the starch with fresh water, and leaving it to settle, it is at length obtained pure, and may be dried. Corn starch is made in the U. S. by soaking corn in water containing caustic soda or hydrochloric acid to dissolve the gluten, grinding, washing on sieves, etc. The cheapness and excellence of this starch has put an end to the importation of starch, and much is now exported. Rice starch is largely made in Great Britain, France, and Belgium. The rice is first soaked in weak lye, then ground, and washed on a sieve. Potato starch is largely made in Europe and the U. S. Horse-chestnut starch is made in France.

Starch is a white shining powder, soft to the touch, grating between the fingers or the teeth, sometimes consisting of amorphous masses, but more frequently of granules recognizable by the microscope. Starch, so long as it retains its natural state of aggregation, is insoluble in *water, alcohol,* and *ether*; but when placed in contact with *hot water*, the water penetrates between the different layers of which the granules are composed, swelling them up and forming a gelatinous mass known as *starch paste*, and used for stiffening linen, etc.

Starch is used for stiffening cotton and linen cloth, paper, etc. Corn starch possesses the highest, and potato starch the lowest, stiffening qualities. It is used for food, as arrowroot, tapioca, sago, etc., for making paste, for dextrin, glucose (corn sirup), etc. For the nutritional value of starch, see FOOD.

Star Cham'ber, in English history a high court of justice supposed to have derived its name from the fact that the room in which it was held at Westminster was decorated with gilt stars. As early as the reign of Edward III, the chancellor, treasurer, justices, and others are mentioned as exercising jurisdiction in the "star chamber." Its powers are thought to have been derived from the council which in 1453 was recognized as having jurisdiction over all cases not determinable by common law, but which declined in power during the Wars of the Roses. By the act of 1488, Henry VII empowered a committee of the council to act as a court of justice with jurisdiction over cases in which the operation of the law was wrongfully impeded. It had the right to punish without a jury the misdemeanors of sheriffs and juries, and in spite of its arbitrary nature was of use in quelling the turbulent spirit of the great nobles and establishing order. In Henry VIII's reign its powers were reabsorbed by the council, but thenceforth the composition of the court was uncertain. Its jurisdiction, which was equally vague, comprised in practice almost every class of offenses, and it could inflict any penalty short of death. Indeed, it claimed its power as representing the King's Council. Its abuse of torture to extort confessions, and its condemnation of persons who were not given an opportunity to defend themselves, made it particularly odious. The peculiar uncertainty of its legal rules made it the defense of absolute power, and under the Stuarts its arbitrary decisions and cruel punishments brought down upon it the popular hatred. It was abolished in 1641.

Stare Decisis (stă'rĕ dĕ-sī'sĭs), a shortened form of the maxim, "*stare decisis, et non quieta movere*"—"to stand by decisions and not to disturb matters once settled." Ordinarily, it applies only to decisions of the court in which the question is again mooted, or to those of its superior. At times, however, the rule is followed with regard to decisions of inferior courts and even to decisions of executive departments, which have been acquiesced in by the public and under which rights have been acquired.

Star'fish, any animal of the *Echinodermata*, order *Asteroidea*; characterized by having the body more or less star shaped, and without sharp distinction between the five or more rays or arms and the central disk. The body wall is hardened with plates and spines; the mouth is in the center of the lower surface of the disk, and the vent, when present, is above. Each arm bears on its lower surface two zigzag rows of tubular suckers, by means of which the animal moves or anchors itself; while at the tip of each ray is an eye spot. The round spot noticeable on the upper surface is a strainer through which water is admitted to tubes connected with the suckers. The sexes of the starfish are separate, and the eggs are usually committed to the waves. Starfish lack all hard armature to the mouth, and they eat by protruding the stomach, inserting it into the mollusc upon which they feed. They are extremely destructive to oysters.

Star'gazers, marine fishes of the *Uranoscopidæ*. The best-known species is *U. scaber* of the Mediterranean; two species are found on the Atlantic coast of the U. S., but most of the species are E. Indian. They are spiny fishes, having the eyes on top of the head, whence the name.

Stark, John, 1728-1822; American military officer; b. Londonderry, N. H. In 1754 he entered the service against the French and Indians, and in 1757 was made a captain. In 1775 he became colonel of a regiment which formed the left of the American line at Bunker Hill. He was in the expedition against Canada, and in 1776 joined the army under Washington. He led the van in the attack upon Trenton, and was in the battle at Princeton.

Being aggrieved at Congress in regard to promotions, he resigned his commission, April, 1777. In 1777 he was in command of the New Hampshire troops raised to oppose the British advance from Canada, and on August 16th fought the battle of Bennington, for which Congress made him a brigadier general. He afterwards cut off Burgoyne's retreat from Saratoga. In 1778 he was placed in command of the N. department; in 1779–80 he served in Rhode Island and New Jersey, and at West Point was a member of the court-martial for the trial of Maj. André; and in 1781 he again had command of the N. department. After the war he retired to his farm.

Star'ling, the *Sturnus vulgaris*, a common European bird. It is a favorite, especially with the Germans, who have it caged, and teach it to whistle tunes and even speak words. The bird is 8½ in. long, black, with violet and green reflections and buff spots. It has been introduced into the U. S.

Common Starling.

Star of Beth'lehem, plants of the *Liliaceæ*, native of Europe, but widely grown in the U. S. Their clusters of white, waxy, star-shaped flowers are very common in gardens, though their odor is not pleasant to all. They are propagated from offsets of their bulbs.

Star of In'dia, Or'der of the, British order of knighthood, to reward distinction in the government service in India. It was instituted in 1861, and reorganized, 1866 and 1878. It consists of the sovereign, the Viceroy of India, and three classes of members: (1) knights grand commanders (G. C. S. I.); (2) knights commanders (K. C. S. I.); and (3) companions (C. S. I.). The badge is a light-blue ribbon with white stripes, and the motto, "Heaven's Light our Guide."

Stars, in general, immense masses of matter, at a temperature so high as to be self-luminous, scattered through space, and of the same general nature as the sun. According to the nebular hypothesis, each mass is hot because it has never had time to cool since it was first formed from the condensation of the nebulæ. Like the sun, the stars are surrounded by atmospheres of vapor, cooler than themselves, and spectrum analysis shows that they are composed of chemical elements similar to those found upon the earth.

The number of stars which can be seen at one time by the average eye, on a clear evening, may be estimated as between 2,000 and 2,500. As only half the celestial sphere is above the horizon, and few stars can be seen near the horizon, owing to the vapors in the atmosphere, the number in the whole celestial sphere is more than double that visible at any one time. The number in the heavens which the ordinary eye can see is about 5,000, but these are only a small proportion of the whole number, the great majority being invisible without telescopic aid. No exact estimate has ever been made of the total number visible with the great refractor of the Lick Observatory, but it would probably exceed 50,000,000.

An ancient system of estimating the apparent magnitudes or brightness of the stars, still in use by astronomers, divided the stars into six orders of brilliancy. About twenty of the brightest stars were called of the first magnitude. Next in order came the brightest stars of the Great Bear and of Cassiopeia. These were of the second magnitude. The successive magnitudes corresponded with the continually diminishing degree of light, until the sixth was reached, which included the faintest visible with the naked eye. The original division into magnitudes was made from estimates by the eye. In modern times greater exactness has been aimed at, though not always attained, by the use of decimals. Thus a star of 2.5 magnitude stands midway between stars of the second and third degrees of brilliancy. The number of stars of each magnitude increases with their minuteness. Roughly speaking, there are three times as many of the second magnitude as of the first; three times as many of the third as of the second, and so on. In the case of the fainter stars, however, the progression is not so rapid. There are between two and three times as many stars of the sixth magnitude as of the fifth; probably about twice as many of the seventh as of the sixth, and so on.

In former ages the figures of men, animals, or natural objects were supposed to be delineated on the face of the nocturnal sky, so as to include all the principal stars, and the stars were designated by the particular limb or part of the animal in which they were found. The bright red star, Aldebaran, for example, in the constellation Taurus, formed the eye of the bull, and two other smaller stars were at the ends of his horns. So we have three stars forming the belt of Orion, and three others his sword. In ancient times special names were given to several of the brighter stars; thus Arcturus is alluded to in the book of Job. The Arabs introduced special names for 100 or 200 of the stars. Some of these names are still used, but the tendency is to designate the stars according to the system of Bayer, introduced abt. 1600. All the stars of a constellation have the name of that constellation as a surname. The Christian names are the letters of the Greek alphabet, α, β, etc. These letters are used in each constellation in the same manner that persons of different families may have the same Christian name. The first letters of the alphabet are usually applied to the brighter stars. Thus α Ursa Minoris is one of the two brightest stars in Ursa Minor; β Ursa Minoris is the other; γ Minoris is the third in the order of brilliancy, etc. When the Greek alphabet was exhausted, in the case of any one constellation, the Italic alphabet was used. In modern times several stars are represented by one of Bayer's letters and a number attached to it. Thus two stars in Aquarius are represented by h_1 and h_2 respectively.

Flamsteed, in making his catalogue of stars, found that he had to include so many stars not lettered by Bayer that he used numbers, instead of the Greek and Italic letters. These numbers were arranged in the orders of right ascension; thus 1 Scorpii was the first star in Scorpius which passed the meridian, 2 Scorpii the second, etc. The system commonly used now is to designate the star by Bayer's letter, when it has one, otherwise by Flamsteed's number. Stars which have neither letter nor number are distinguished simply by their magnitude, right ascension, and declination, or by their number in some well-known catalogue; but for uniformity the constellation to which they belong is frequently indicated. No distinct law has yet been formulated as to the distribution of the stars in space. In certain parts of the heavens the stars are heaped together in clusters. The telescope reveals wonderful groups, such as that in Hercules, which contains thousands of stars in a small space, spreading at the edge into curved sprays. A group near κ of the S. Cross shows an aggregation of variously colored stars.

CONSTELLATIONS.

A. *Northern Constellations, between the zenith of latitude 45° and the pole.*

1 Ursa Minor.
2 Draco.
3 Cepheus.
4 Cassiopeia.
5 Perseus.
6 Camelopardus.
7 Lacerta.
8 Lynx.
9 Ursa Major.
10 Canes Venatici.

B. *Mean Constellations, between the zenith of latitude 45° and the equator.*

11 Andromeda.
12 Equuleus.
13 Pegasus.
14 Pisces.
15 Triangulum.
16 Aries.
17 Auriga.
18 Taurus.
19 Gemini.
20 Canis Minor.
21 Cancer.
22 Leo.
23 Leo Minor.
24 Coma Berenices.
25 Boötes.
26 Corona Borealis.
27 Hercules.
28 Lyra.
29 Cygnus
30 Vulpecula.
31 Sagitta
32 Delphinus.

C. *Southern Constellations, from the equator to the southern horizon.*

33 Cetus.
34 Eridanus.
35 Orion.
36 Monoceros.
37 Lepus.
38 Columba Noachi.
39 Canis Major.
40 Argo Navis.
41 Hydra.
42 Sextans Uraniæ.
43 Virgo.
44 Crater.
45 Corvus.
46 Centaurus.
47 Serpens.
48 Ophiuchus.
49 Scutum Sobieskii.
50 Aquila et Antinous.
51 Libra.
52 Lupus.
53 Scorpio.
54 Sagittarius.
55 Capricornus.
56 Aquarius.
57 Piscis Australis.

Northern Constellation	10
Mean Constellation	22
Southern Constellation	25
Total	57

These 57 constellations include 13 stars of the first magnitude, 48 of the second, 152 third, 313 fourth, 854 fifth, 3,974 sixth, with 41 variable stars, 19 star clusters, and 7 nebulæ; in all 5,421 stars of the sixth magnitude are the smallest visible to the naked eye.

Certain stars vary in brilliancy from time to time. The two most remarkable ones are o Ceti and β Persei, or Algol. During the greater part of the time the former of these stars is invisible to the naked eye; but at intervals of about eleven months it becomes plainly visible, and after retaining a maximum brilliancy for some two weeks fades away again. Its maximum brilliancy, however, is very different at different appearances, ranging from the second all the way to the fifth. In the S. hemisphere η Argus for several centuries has varied in a singular manner. The first record of it was by Halley in 1677, when it was classed as of the fourth magnitude. In 1837 Sir John Herschel, while making observations at the Cape of Good Hope, was astonished by the appearance of a new star of the first magnitude, which he found to be η Argus. Its light was, however, nearly trebled, being then greater than that of Rigel. He states that the light continued to increase until the beginning of 1838, when it was brighter than most of the stars of the first magnitude. It then gradually faded away for two or three years, but in 1842 and 1843 blazed up brighter than ever, so as to be the brightest star in the heavens, except Sirius. Since that time it has been steadily diminishing.

With most of the variable stars, the changes of light go on so continuously as to show that it is due to the constitution of the star itself. The theory which at present seems to rest upon the best foundation is that the variations are due to a process analogous to that of the formation of spots on the sun. The spots on the sun go through a regular period in eleven years. It may therefore be called a variable star, with a period of eleven years. It may therefore be said that variations in brilliancy among the stars are due to the regular formation of spots like those on the sun, at intervals which are sometimes fairly regular.

A slight examination will show to any observer that the stars are of different colors. The great majority are white. A few, such as Sirius and Alpha Lyræ, have a slightly bluish tint. Many others, as Aldebaran, Arcturus, Antares, and Alpha Orionis, have a reddish tinge. These differences of color are probably due in part to differences in the temperature of the stars, and in the absorbing power of the atmospheres which surround them. It is familiarly known that the color of the light emitted by a piece of heated iron is at first red, and then it changes toward white as the iron gets hotter. There is little doubt that the red stars are not at so high temperature as those of other colors. Stellar spectra show that the stars contain the same elements as the earth and the sun—hydrogen, sodium, iron, etc.

There is no well-established case of a known star disappearing from the heavens. The supposed cases were those when an observer had made some mistake in recording the position of a star, so that future observers on looking at the place found it vacant. Stars apparently new appear from time to time. The most extraordinary on record was that of 1752, described by Tycho Brahe. For nearly a month it was so bright as to be discernible in full daylight. It then faded away, and at the end of another year gradually became invisible. The position of the star was determined by Tycho as well as his instruments would permit, and there is now a telescopic star near the place. Kepler records a similar star, which appeared in 1604, in the constellation Ophiuchus. In October of that year it was of the first magnitude, and remained visible during 1605. It faded away early in 1606, and the question whether such stars were new might have been considered an open one until the appearance of T Coronæ in May, 1866. It was first seen on the 11th of that month, when it had attained the second magnitude. On the question whether the star was visible before that day the testimony is conflicting. The most important circumstance connected with this star is that it was found to have been already recorded in Argenlander's catalogue, being a telescopic star of the ninth magnitude. A few days after it blazed forth it began to fade again, and has since diminished to its former state. In 1892 a new star appeared in the constellation Auriga, but it did not rise above the fifth magnitude, and might therefore have passed unnoticed. No certain explanation can be given of these phenomena.

To the unaided vision the stars seem to preserve the same relative position in the heavens from year to year and from century to century, but the refined measurements of modern astronomy show a slow motion to be taking place in at least all the brighter stars. This motion, however, does not follow any exact law that has yet been discovered, except to the extent that there is a preponderance of motions in a certain direction in the heavens which may be described as from the constellation Hercules in the N. hemisphere toward that of Pictor in the S. For shooting stars, see METEORITE. See also ASTEROID; COMET; METEOR; PLANET.

Star'stone, a variety of sapphire, the *asteria* of the ancients, found in Ceylon. It presents, when cut *en cabochon,* or in a hemispherical form, and viewed in a direction perpendicular to the axis, a peculiar reflection of light in the form of a star.

Starva'tion, or **Inani'tion,** the condition of tissue waste, exhausted vitality, and death resulting from prolonged privation of food. A slower starvation ensues when food is scanty and impure, or is deficient in one or more of the constituents essential to man. Animals have been fed experimentally on single classes of food—one upon albuminoid matter, another partaking of only farinaceous substances, a third only of the hydrocarbons or fats. Such exclusive diet proved disastrous; emaciation, enfeeblement, and death by starvation ensued. The phenomena of starvation have been recorded by the shipwrecked, by persons immured in mines, and Arctic explôrers.

Prolonged abstinence necessitates bodily waste; hence the reported cases of prolonged subsistence without food, usually women apparently in a state of trance or catalepsy, are not to be accredited; carefully investigated, they invariably prove to be artful deceptions by hysterical or demented persons. Rigid exclusion of food and drink causes death in from five to eight days. Water, freely supplied, may prolong life two or three weeks, exceptionally longer. Water constitutes over half the weight and bulk of the body, and even solid food, so called, is in part water. Starvation at the outset produces urgent hunger; this may gradually lessen, be replaced by faintness, loss of appetite, and even loathing of food. The strength fails, the body wastes, the mind becomes enfeebled; in some cases there is listlessness and stupor, in others excitement and delirium. The starving person is liable to intercurrent disease, and the community suffering privation is often visited by epidemics of malignant and fatal type, consequent upon the nervous depression and vitiated blood of the victims. Starving persons, when rescued, should not be supplied too suddenly or freely with food; the enervated digestive apparatus can retain and assimilate but small quantities at a time, an excess exciting irritation and dangerous diarrhea. Certain diseased conditions may cause starvation; such are stricture and cancer of the œsophagus and upper orifice of the stomach, and tubercle of the intestine.

Stassfurt (stäs'fort), town; province of Saxony, Prussia; on the Bode; 20 m. SSW. of Magdeburg. It is noted for the immense layer of rock salt in its vicinity, discovered in 1837 at a depth of 826 ft. and with a thickness of 1,000 ft. The production in 1887 was 201,962 tons of rock salt and 1,294,081 tons of other salts. An extensive chemical industry has been built up. Pop. (1900) 20,031.

State, in its present sense, a body politic; a self-governing community organized under permanent law which has for its aim justice and the security of all. It is the best term for denoting communities on their political side whatever their form of government be. The term nation implies common origin and language. The kingdom of the Netherlands, such as it was before the disruption in 1830, consisted of inhabitants speaking three languages—Dutch, Flemish, and French—with various earlier institutions and political connections. This was in no sense a nation, but was a state. So Austria at present is not a nation, but is a state where three nationalities at least—a German, a Hungarian, and a Slavonic, to say nothing of Polish and Roumanian and other subjects—are bound together under the same political institutions.

State, Depart'ment of, an executive department in the U. S. Govt., having charge of the relations of that government with foreign powers. Its head is the Secretary of State, who ranks as the first of the Cabinet officers. The secretary not only is charged, under the direction of the President, with all negotiations relating to foreign affairs, but is the medium of correspondence between the President and the executive of the several states, is custodian of the great seal of the U. S., and publishes the laws and resolutions of Congress, proclamations admitting new states into the Union, and amendments to the constitutions. He is further required to issue reports of information received from the consular and diplomatic service.

Stat'en Is'land, largest island in New York harbor; formerly Richmond Co., N. Y., now the Borough of Richmond, New York City; length, 13 m.; width, 8 m.; area, 58½ sq. m.; and is bounded on the N. by the Kill von Kull, E. by New York harbor, New York Bay, and the Narrows, SSE. by Raritan Bay and the lower bay of New York, and W. by Staten Island Sound. January 1, 1898, it was annexed to the city of New York as the Borough of Richmond, and the five towns into which it was divided became wards. The island is very hilly. A mile SE. of Clifton is Fort Wadsworth, guarding the approach to New York harbor; on the N. shore is the Sailors' Snug Harbor, and between St. George and Tompkinsville is a U. S. lighthouse. The island is a place of residence of many New York business men. Pop. (1908) 80,250.

State Rights. See SOVEREIGNTY.

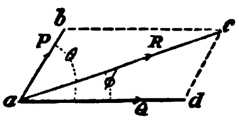
State's Ev'idence, or (in Great Britain) **King's** or **Queen's Evidence,** a phrase popularly used to describe the evidence of an accomplice, generally given under an arrangement made with the officer representing the state that the witness so testifying shall not himself be prosecuted for the crime of which he confesses himself to be guilty while he is disclosing the guilt of the party on trial. It is often necessary, in order that the ends of justice may not be defeated, that one of several criminals should be suffered to testify on the trial of his fellows, although his evidence may show himself to be guilty. When and with whom such an arrangement shall be made rests on the sound discretion of the officer who represents the people, or, if suit has already been instituted, of the court. Such evidence is of course suspicious, and it has even been said that no conviction should be had upon the uncorroborated testimony of an accomplice. A jury has the power to convict upon such evidence, and their verdict could not be set aside as illegal. See EVIDENCE.

States-Gen'eral, an assembly composed of representatives of the nation. In France it consisted of representatives of the three orders —the nobility, the clergy, and the third estate, or the *bourgeoisie.* Its origin seems to date back to Charlemagne. The first convocation of which history gives authentic report is that of Blois, 1302, by which Philippe le Bel tried to give a greater weight to the course he had adopted in his quarrel with Boniface VIII. The most memorable convocation was that of 1789, which ushered in the revolution. In Holland the name States-General is applied to the legislative body of the kingdom, there distinguishing that assembly from the merely provincial states. The Dutch States-General is composed of two chambers—the upper, elected by the provincial states, and the lower, chosen by the citizens.

States of the Church. See PAPAL STATES.

Stat'ics, that branch of mechanics which treats of the properties and relations of forces in equilibrium. By equilibrium is meant that the forces are in perfect balance, so that the body upon which they act is in a state of rest. The word statics is used in opposition to dynamics (*q.v.*), the former being the science of equilibrium or rest, the latter of motion, and both together constituting mechanics.

In statics, forces are measured by the pressures that they will produce; the unit of pressure is usually a certain effect of the force of gravitation as indicated by a spring balance (not by a steelyard or scales) acted upon at some assigned place by a definite quantity of matter measured in pounds, kilograms, etc., and represented by lines, the lengths of the lines being proportional to the intensities of the forces, their directions parallel to the directions of the forces, and their ends denoting the points of application of the forces. The resultant of two or more forces is a single force which produces the same effect as the several forces acting together. The components of a single force are forces whose united action produces the same effect as the single one. The process of combining forces into a resultant is called composition, and that of separating a single force into components is called resolution. These processes are effected by means of the principle of the parallelogram of forces, which is thus stated: If two forces *P* and *Q* acting upon the material point *a* are represented in intensity and direction by the lines *a b* and *a d,* their resultant *R* will be represented in intensity and direction by the diagonal *a c* of the parallelogram *a b c d* constructed upon the two given sides.



Another fundamental law is the principle of moments (See MOMENT.) Statics considers also parallel forces and the determination of centers of gravity and moments of inertia of bodies, and the equilibrium of forces acting through the cord, lever, pulley, inclined plane, and screw, of which all machines are compounded, together with their modification by the forces of friction and cohesion. The laws of the equilibrium of gases and of liquids (hydrostatics), with their applications to the barometer, pump, and hydrostatic press, are then developed. Among the more complex aspects of statics are the theory of the equilibrium of arches and bridges, the theory of the flexure of elastic bodies, the theory of the strength of materials subject to forces of tension, compression, shearing, or torsion, the theory of the tension of fluids, and the statics of molecules.

Sta'tions of the Cross, a series of figures or pictures, usually fourteen, representing the stages of the *Via Dolorosa,* or "Christ's Passion on the way to Calvary." They are generally found in every Roman Catholic church. In Roman Catholic countries they are often erected by the wayside, in cemeteries, on prominent sites, etc.

Statis'tics, in its simplest meaning, a description of any class of facts expressed by means of figures. The Book of Numbers is a statistical report. There is record of statistical work in China in 2300 B.C. In Greece and Rome also there were systematic collections of data pertaining to national life. In 594 B.C. a census was taken in Greece for the purpose of levying taxes which divided the people into four classes according to wealth. Athens took a census of population in 309 B.C. The constitution of Servius Tullius, 550 B.C., distinguished six property classes. In the Middle Ages there was national enumeration of population or of property. The work, however, was suggested by some practical necessity, as the "Domesday Book" of William I, 1088 A.D., or the "Land Register" of Waldemar II, 1231 A.D. In France the need of definite information as to national conditions following the revolution was recognized, and a commission established to collect data for reforms in administration and finance. This led to the establishment of statistical bureaus in France, as also in other countries.

The phrase, "science of statistics," has been loosely used to convey a number of indefinite ideas. Its claim to be a science usually rests on the observation of uniformity in those domains of human activity which are commonly regarded as subject to the control of the individual. For example, one would suppose that suicides, being wholly under the direction of the individual will, would show no rule of recurrence, but a study of the statistics of suicides shows that nothing is more constant in its recurrence than the cause for which, the time in which, and the manner by which suicides are committed. The same is true in any domain of human activity, so much so indeed that by the use of statistics one is able to predict with great assurance what is likely to happen. This fact, however, does not seem to make good the claim that statistics is an independent science, but indicates rather the possibility of scientific treatment of all social and moral questions. Statistics therefore comes to be a method of investigation, a branch of the science of logic. Accepting, then, statistics as a science of method, it may be regarded as consisting in a systematic observation and classification of facts.

Among the most frequent errors made in dealing with statistics are the consideration of percentages without regard to the figures upon which they are founded. For example, an increase of 10 m. in railway mileage in a district which had but 10 m. to start with would show a higher percentage of increase than an increase of 1,000 m. in a district which had 10,000 m. of line at the outset. One who reasons by means of percentages must hold constantly in mind that he is dealing with ratios, and not with absolute facts. Caution is also necessary in drawing conclusions from averages. In the first place, a sufficiently large number of individual facts must be collected to nullify the influence of any unusual or abnormal cases. Then individual facts should be allowed to influence the average in proportion to their relative importance. For example, wheat is relatively of more vital importance to the people than silks, and any investigation which holds in view the effect of changes in prices on the well being of a community must lay greater stress on variations in the price of wheat than in that of silks. Again, it will not do in determining the average of wages to rely upon the daily rate of wages reported as paid, but the number of days in the year for which the workmen receive the stated wages must also be taken into account.

Under population statistics are included an extensive class of facts. Thus, in addition to the actual count, there is a classification of population by territorial groups to discover the density of population. Changes in population are also included, with all questions of birth rate and death rate (vital statistics) and immigration. The facts pertaining to the physical life of the people are also included under population statistics, as, for example, expectation of life at various ages, classification on a basis of age, etc. Under industrial statistics are included all facts pertaining to the production, exchange, distribution, and consumption of wealth; also to the means by which the industrial process is carried on. Statistics of wages, capital, railways, money, prices, and the like are all included under industrial statistics. The statistics of social and political life include the facts descriptive of the manner in which people live and of the governments under which they live. Moral statistics include all facts which indicate the character and habits of the people, education, religion, crime, marriage, etc.

In the Federal Constitution it is provided that a census shall be taken once in ten years, and many of the states also require that a state census shall be taken at certain intervals. In 1870 the scope of the federal census was greatly extended until at present it may be regarded as a general statistical bureau. The Agricultural Department has a bureau of statistics which aims to collect facts of interest to the growers and consumers of farm products. The Treasury Department, in addition to financial statistics, maintains a bureau of statistics on imports and exports of the U. S. The comptroller of the currency reports upon banking, and the director of the mint upon coinage and the production of the precious metals. The commissioner of education reports on the number of schools, colleges, and universities in the republic, the number of pupils attending each, the number of teachers, their compensation, etc. The Interstate Commerce Commission provides for the statistics of railways. Congress frequently authorizes special investigations into special topics. The public documents of the Federal Government are rich in statistical material, while many of the states maintain efficient bureaus for the collection of facts of local interest.

Sta'tius, Publius Papinius, b. abt. 45 A.D., in Naples; Latin author; court poet to the emperor Domitian. It has been said, without foundation, that he was a Christian, and that the emperor Domitian stabbed him in a moment of anger. Some of his works are extant.

Stat'uary. See Sculpture.

Sta'tus, a term of the Roman law, denoting the legal condition of a person, or the sum of his capacities and incapacities to hold legal rights or to be subjected to legal duties. In the Roman law there were three grades of status or legal condition, the lower and more general of which might exist without the others, while the higher and more special always presupposed the lesser. The first and most general was that of liberty (*status libertatis*), by virtue of which a person was either a freeman (*liber*) or a slave (*servus*). The second was that of citizenship (*status civitatis*), by virtue of which a person was either a citizen (*civis*) or a stranger (*peregrinus*). The highest was that of the family (*status familiæ*), by virtue of which a person might be the head of a household (*paterfamilias*) and his own master (*sui juris*), or under the control of another (*alieni juris*), as a son, daughter, wife, ward, and the like.

Stat'ute of Frauds. See Frauds, Statute of.

Statutes, laws in a written form enacted by the supreme legislative authority of a nation or commonwealth, as contradistinguished from laws established by judicial decision. The extent of the powers held by law-making bodies is determined by the organic law of each country. The British Parliament is said to be omnipotent, which simply means that the restrictions under which it ordinarily acts are self-imposed. In the U. S. the most remarkable feature of the political organization is the limitation of the legislative function contained in all the written constitutions, which are themselves fundamental statutes adopted by the people in their sovereign capacity. With every new revision of the state constitutions this limitation in reference to the forms and modes of legislation, as well as its subject-matter, is made more far reaching, minute, and prohibitory.

The time when statutes take effect is fixed in most of the states of the U. S. either by a constitutional provision or by a general law. In some they become operative at the expiration of a specified number of days after the close of the session, in others at a specified period after the day of their passage; but the legislature may in the body of a statute prescribe a different time, as, for example, that it shall take effect immediately. The common law made an act operative from the first day of the session at which it was passed, but this absurd doctrine was abolished in the thirty-third year of George III, and all laws were declared to be binding from the time when they received the royal assent. The repeal of a statute may be either express or by implication. It is express when effected by a clause inserted for that specific purpose in a subsequent act; it is by implication when the provisions of a later enactment are wholly and irreconcilably inconsistent with those contained in an earlier one. Repeal by implication is not favored. If the two statutes concerning the same subject-matter can possibly be harmonized, both will stand; if the contradiction is absolute, the prior one gives way. See Law; Code.

Staub'bāch ("dust stream"), a celebrated waterfall of Switzerland, in the canton of Bern; has a descent of between 800 and 900 ft. Before the water reaches the bottom it is dissolved into spray and carried away by the wind, which gives it a singularly beautiful resemblance to a lace curtain floating in the air.

Stavro'pol, government of Russia, on the Caspian Sea; area, 23,397 sq. m. It is mostly low and flat, with shallow lakes and extensive swamps. In the SW. agriculture is the principal occupation; wheat, millet, and mulberries are cultivated. In the N. the inhabitants are nomads, and immense herds of cattle, horses, and sheep are reared. Pop. (1907) 1,048,100.

Steam, the vapor of water. Pure steam is an invisible gas and must be distinguished from the white clouds of vapor which consist of minute drops of water temporarily suspended in the air. Water, and even ice, at all temperatures, when not confined within impermeable walls, continually give off vapor, the surface particles assuming the gaseous state with a rapidity determined by the temperature of the mass and the nature and density of the surrounding atmosphere. When confined, this gasification goes on without regard to the character or density of the atmosphere present until the vapor produced, by gradual accumulation, acquires the maximum density and pressure attainable at that temperature. The pressure rises faster than the temperature. Under pressure of one atmosphere the boiling point is 212° F.; at four atmospheres it is 301°, while at twenty it is 444°. This temperature is called the temperature of saturation under the given pressure. When the process just described is carried on in a vessel open to the atmosphere, the issuing vapor mingles with the molecules of that atmosphere as rapidly as formed, and separates only at the surface, until the boiling point is reached. See Boiling Point.

Steam, as worked in the steam engine, if not dried by superheating, is wet; *i.e.*, it carries in suspension fine particles of water. A cubic inch of water makes a cubic foot of dry steam. The principal advantage of superheating is an increase of economy due to the thorough expulsion of water from the vapor, and consequent reduction of loss by condensation and revaporization in the steam engine cylinder. A less degree of improvement is due to the simple increase of temperature, and to the consequent widening of the range of temperature within which it is worked. The following table gives a summary of the properties of steam. Pressures are given in pounds per square inch above a vacuum, and in inches of mercury measuring from the same point. Volumes are relative to water at its greatest density. Weights are given in pounds, and specific gravity is referred to air as unity at a temperature of 32° F.

The distribution of heat in each pound of steam evaporated at 212° F. is as follows:

	Units of Heat.	Mechanical Equivalent in Foot Pounds.
A. The sensible heat:		
1. To heat the water from 32°, or through 180°	180.9° =	139,655
B. The latent heat:		
2. To convert the water to vapor, irrespective of pressure on surface	892.9° =	689,242
3. To advance against and remove the incumbent atmosphere, whether air or previously generated steam, its pressure being 2,116.8 lb. per square foot of surface	72.3° =	55,815
Total latent heat	965.2° =	745,057
Total heat of steam	1,146.1° =	884,712

See Steam Boiler; Steam Hammer; Steam Vessels.

Steam Boil'er, an apparatus for generating steam by the application of heat. In general terms it may be described as a closed metallic vessel, kept partly filled with water and so arranged that heat may be imparted to the water by means of the combustion of fuel. The steam generated is confined in the vessel above the water until it is required for use, when it is drawn off through pipes. This metallic vessel, with its compartments and openings, takes the name of "boiler" in the shops where it is manufactured; but in many classes or forms of boilers the steam-generating apparatus is not complete until the boiler is set up in brickwork, with an external furnace constructed for the combustion of the fuel and external flues for conducting the heated gases to the chimney along the sides of the boiler. In other cases the boiler is ready for use as it comes from the manufacturer, having within its external shell all these necessary arrangements for combustion and draught. In all cases certain adjuncts and appurtenances are necessary, such as the feed pump or other means of supplying water, the safety valve, steam and water gauges, and grate bars for the furnace.

Boilers may be classified under a few types, which will serve to illustrate not only general principles of construction, but the adaptability of the various forms to particular circumstances of use. While the sphere is a form of inclosing envelope which is best adapted for the resistance of internal fluid pressure, it is not the best adapted for the application of heat, nor is it the cheapest form of construction. The nearest approach to it which is practicable is the cylinder with hemispherical ends. Boilers may be divided into two great groups known as the externally fired boilers and the internally fired boilers respectively. In the first class are included all boilers whose furnace is external to the proper structure of the boiler, and in the second class all those in which the water to be evaporated surrounds the furnace. The first class require a brick setting, while the second class do not, but are self-contained. The latter, while more costly, have these advantages: There is less loss of heat from radiation, they make steam more rapidly, and a great evaporative capacity is secured in a very compact form.

Fig. 1 is a type of externally fired boiler of the simplest form, being a plain cylindrical shell with a dome for the collection of steam. It is bricked in, the furnace being exterior to the boiler shell. This type is used where gaseous fuels are employed and where the water contains chemical salts liable to precipitation upon boiling, as in iron works and smelting furnaces. The next type (Figs. 2 and 3) of externally fired boilers are those containing, in the space devoted to water, flues or tubes through which the hot gases pass on their way to the chimney. A type of multitubular boiler is given in Fig. 4. The flue boiler is used where the fuel gives a long flame from the presence of combustible gas, since the fine subdivision of the products of partial combustion which would be the case in tubes would tend to extinguish the flame before complete combustion had taken place. Where complete combustion can take place before the gases enter the tubes the multitubular boiler is preferable by reason of

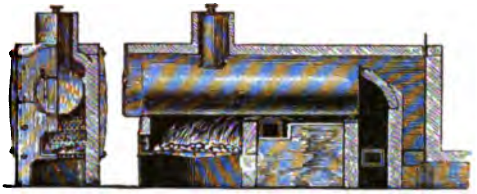
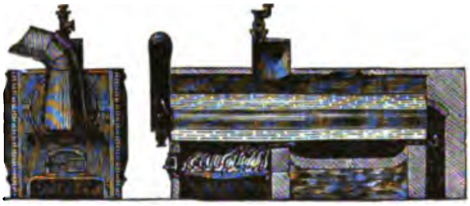


Fig. 1.


Figs. 2 and 3.

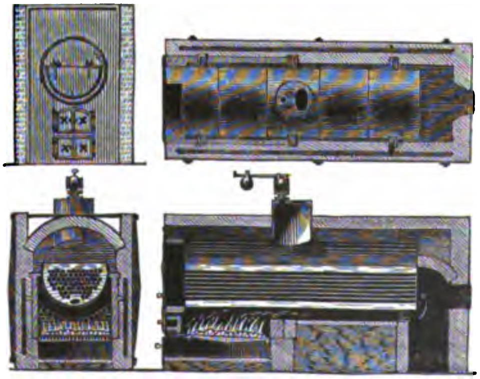


Fig. 4.

its extended heating surface. The fourth type of this class of boiler (Fig. 5) is the sectional or water-tube boiler. It consists of a system of tubes or small units, so arranged as to provide a continuous circulation of water through the tubes. Of the internally fired boilers the most prominent type is the locomotive boiler (Fig. 6).

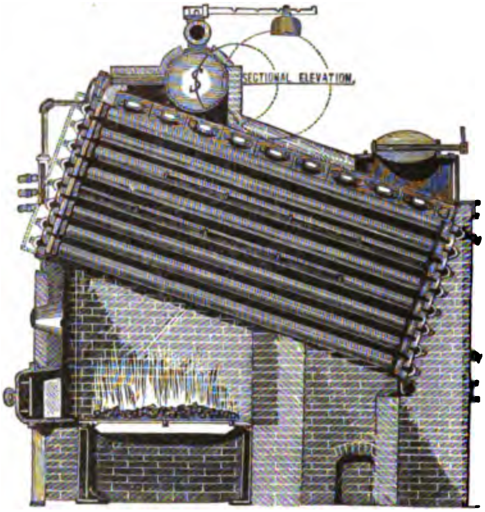


FIG. 5.

A modified form known as the upright boiler is much used for portable and stationary engines.

For marine purposes, where a thoroughly self-contained boiler is a necessity, the internally fired type has received great development, and there are many varieties in use, the most prominent form being known as the Scotch boiler.

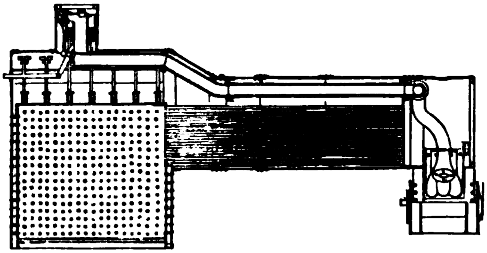


FIG. 6.

The term "horse power" of boilers is often used as the measure of work which it can do. It has been agreed that the commercial horse power of a boiler shall be an evaporation of 30 lb. of water an hour from a feed-water temperature of 100° F. into steam at 70 lb. gauge pressure. See STEAM.

Steam En'gine, a machine for converting heat energy into that of mechanical motion through the medium of steam. It consists of two parts—the boiler, where the steam is "generated" by boiling water, and the engine proper, where the steam acts on a piston, producing motion. Machines where the steam acts on blades set on a rotating wheel, although logically steam engines, are generally called steam turbines or turbine engines. (See TURBINE.) Other vaporizable liquids, as ammonia, ether, or carbon disulphide, may be used with practically the same mechanism, but water has obvious advantages.

Toys in which motion is due to steam pressure were made in old times, but the first useful steam engine is due to Edward Somerset, Marquis of Worcester, in 1663. This applied the pressure directly to a water column for raising it—a plan now again coming into use after three and a half centuries. The first practical piston engine was that of Newcomen, which was improved by Watt. Automatic valves were added by Humphrey Potter. Possibly the most important application of the steam engine is that to traction. See LOCOMOTIVE.

In all engines the steam is admitted from the boiler to a cylinder in which fits a piston, sliding lengthwise. The pressure drives this piston to the opposite end of the cylinder, and this motion, through the connected valve gear, closes the aperture through which the steam was admitted and opens another on the other side of the piston head, so that this is driven back to its first position. This goes on as long as desired. In a type of large engine called "single acting" the steam is admitted only on one side, the piston returning by gravity. Most engines are now "double acting," as described. The steam pressure on the side that is disconnected with the boiler is abolished in any one of several ways. If it is allowed to escape through a valve into the outside air, the engine is called "high pressure," because, as the steam must then work against the ordinary air pressure of 15 lb. to the square inch, its pressure must be great enough to overcome this. Most locomotives are high pressure, and the "exhaust," as it is called, reaches the outer air by way of the smokestack, where the expansion of the waste steam causes the characteristic puffing sound and aids the draught of the furnace.

If the exhaust is directed into a cold compartment or condenser, it is quickly condensed to water, and causes a partial vacuum, so that the steam pressure on the other side has no longer the normal atmospheric pressure to work against, but a much less one. Where condensers can be used, as in steamers and in most stationary engines near bodies of cool water, this form, known as the "condensing" or "low-pressure" engine, is much more economical. If the valve connecting with the boiler be closed before the one on the other side is opened, and while the piston has still some distance to travel, the steam in the cylinder continues to exert its own expansive force, though no longer in connection with the main body of steam in the boiler, and the steam is said to work "by expansion." If the exhaust be connected with a second cylinder, this expansive power of the steam may be sufficient to drive another piston. In this way as many as four different sets of cylinders, at different pressures, may be used. Such an engine is called "compound," and is denominated a "double," "triple," or "quadruple" expansion engine, according to the number of cylinders used. Marine engines are commonly compounded, and the principle has occasionally been applied to locomotives, as in the Vauclain type.

In order to preserve uniformity of motion, devices called "governors" are used. The most common type depends on the centrifugal force imparted to balls rotated at the end of arms connected with the steam valve. As the speed increases, the balls rise slightly and the steam is partly turned off. The action here does not respond quickly and is jerky; but in the Corliss engine the governor does not actually do the work of turning off the steam, but only "indicates" to another mechanism when the work should be done. Another appendage, essential under many conditions, is the fly wheel, a massive wheel which, by its inertia, not only acts to equalize motion, as does the governor, but also carries the engine past its "dead center"—the point where the piston thrusts directly against the axle of the wheel. Where there are two cylinders, the pistons are so connected that the two are never on a dead center at the same time; but with a single cylinder the fly wheel is essential.

The motion of the engine is generally imparted to the machinery through rotating parts. As the motion of the piston is "reciprocating," or to and fro, this necessitates a transformation, which is usually effected through a crank. A reciprocating motion such as that of an engine piston will not in general turn a wheel with uniform regularity; hence an additional reason for the regularizing action of the heavy fly wheel. In the turbine engine, where there are no reciprocating parts, no transformation is required. Since the time of Watt attempts have been made to construct a rotary piston engine, but it has been impossible to avoid leakage and difficult to use the steam expansively.

Engines are sometimes classed as "horizontal" or "vertical," according to the position of the cylinder. In the old vertical marine engines motion was transmitted to the crank by means of a vibrating beam, called the "walking beam" (supposed by some to be a corruption of "working" beam). The vertical rod connecting the other end of this beam with the crank was often called the "pitman," from its use in mine pumps, where it extended into the shaft and connected with the pump rods.

As the steam engine is only one form of heat engine, its efficiency depends on the difference in temperature between the boiler and condenser, or the range through which its working substance (steam, in this case) parts with its heat. The whole amount of heat could not be converted into mechanical energy, even theoretically, unless the condenser was at the absolute zero of temperature. As the practical temperature is far higher and really not very far below that of the hot boiler, only a comparatively small part of the fuel heat is transformed into work—the rest is wasted. Efficiency may be increased by widening the temperature range, either by cooling the condenser to a lower point or by increasing the temperature of the working steam. This may be done by incasing the cylinder in a steam jacket, and is called "superheating"—that is, heating the steam above its condensing point, 212° F.

Steam Ham'mers, hammers which are raised by the direct action of steam on a piston in a steam cylinder, as distinguished from hammers which are raised by other mechanical means, receiving their power from a steam engine through the intervention of belts and pulleys or gearing. A heavy mass of iron constitutes the hammer, or "tup," as it is called. This tup slides freely in guides or ways in the frame or upright of the hammer. On top of this frame is placed a cylinder fitted with piston, piston rod, and valve, after the manner of a steam engine. The piston rod, extending downward, terminates in its attachment to the tup or hammer. Steam admitted under the piston raises it, and thus lifts the hammer; upon the opening of the exhaust and escape of the steam the hammer falls with a force, due to its weight, less the friction of the piston, piston rod, and escaping steam. This form of hammer was at first made single acting only—that is, the steam is used only beneath the piston; but hammers are now made double acting, the pressure of the steam above the piston in the down stroke assisting the action of gravity, thus causing the hammer to strike a more rapid and more powerful blow.

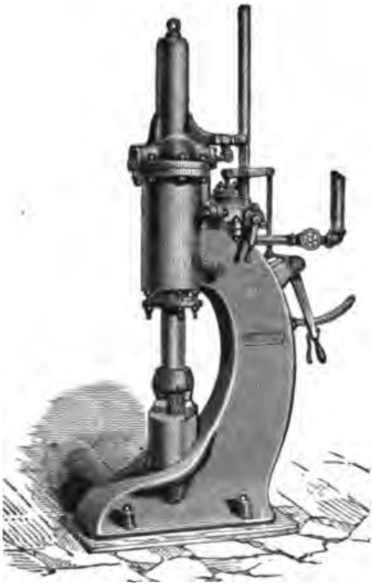


FIG. 1.

The steam hammer was invented by James Nasmyth, of the Bridgewater Foundry, near Manchester, England. Nasmyth's first hammers were worked by hand, but his manager, Robert Wilson, devised a plan of operating the valve automatically; and he also, it is believed, first applied the balance principle of valve to the steam hammer. Hammers for heavy forgings are constructed with double uprights, large-sized hammers with a long stroke, having a wide spread of base between the legs of the upright to give room for the workmen to handle the iron being forged. Fig. 2 shows a double upright hammer. For light work, such as drawing out bars of steel, an automatic valve motion is of the utmost importance. Fig. 1 shows the form of a single upright hammer as used for light forging. See STEAM.

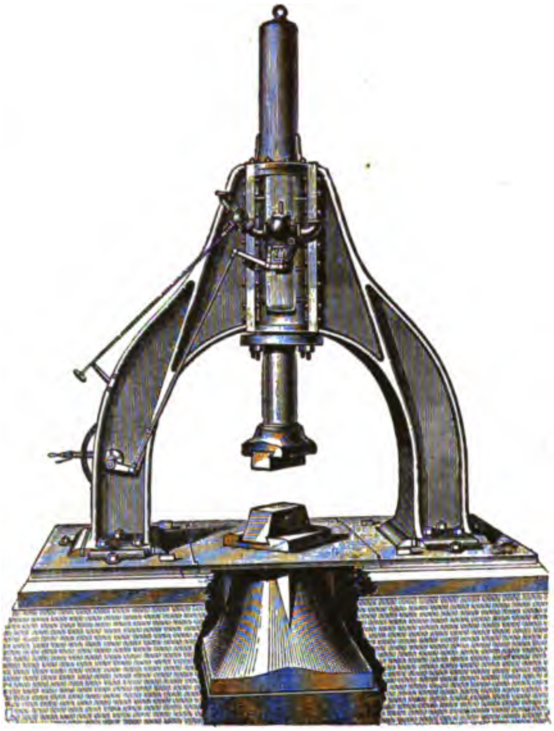


FIG. 2.

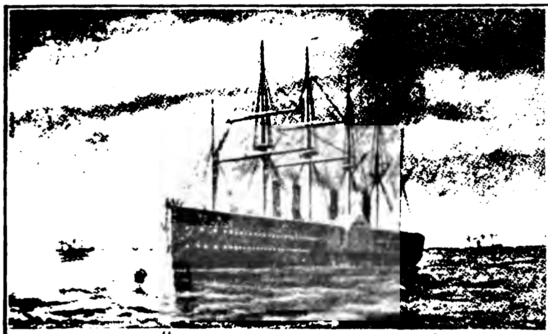
Steam Ves'sels. The possibility of using steam for the propulsion of ships seems to have occurred to Roger Bacon. The earliest practical effort appears to be that of Papin, who in 1707 applied his steam engine to the propulsion of a model on the Fulda River at Cassel. Newcomen had in the meantime brought the steam engine itself to a working condition, and in 1736 Jonathan Hulls patented a marine steam engine to be used in a tugboat. Abt. 1763 William Henry, of Pennsylvania, built a small model steamboat, which he tried with success on the Conestoga River; the experiment furnished the hint to Robert Fulton. James Rumsey, of Maryland, in 1786 built a boat which was propelled upon the Potomac by steam at the rate of 4 m. an hour by means of a jet of water forced out at the stern. He built a boat in London with which a successful experiment was made on the Thames in 1792. Meanwhile John Fitch experimented on the Delaware River. His first boat, built in 1786, was propelled by paddles moved by a steam engine; at first a speed of only 3 m. an hour was attained, but improvements increased that speed to 8 m. He employed side wheels, with a screw propeller at the stern.

Abt. 1790 Robert Fulton left the U. S. for England, where he turned his attention especially to steam navigation. In 1806 he returned to New York, bringing with him a Boulton & Watt steam engine, for which a hull was built. This vessel, the *Clermont*, made a trial trip to Albany, August 7–9, 1807, returning on the two following days, her average running speed being 5 m. an hour. The *Clermont* was 130 ft. long, 18 ft. beam, 7 ft. deep, with a burden of 160 tons. She soon began making regular trips between New York and Albany, and for all practical purposes must be considered the first steamboat adapted for the conveyance of passengers and freight. John Stevens, of New York, was even earlier than Fulton an experimenter in steam navigation. The first steamboat in Great Britain was the *Comet*, 40 ft. long, built in 1812 for the navigation of the Clyde. As early as 1819 the steamer *Savannah* made the voyage from Savannah, Ga., to Liverpool, England, in twenty-two days, and thence to Russia. From that time the development in ocean steamships has been steadily toward larger steamers, including the famous *Great Eastern*, the *Dreadnought* among battleships, and the *Mauretania* among ocean liners.

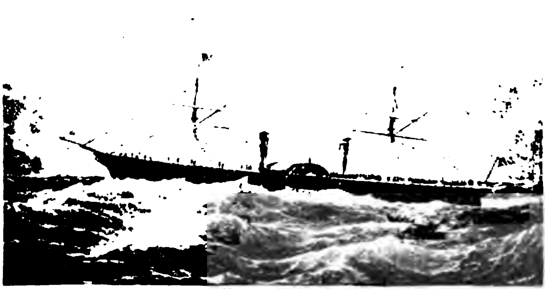
STEAM TURBINES, now used upon some ocean steamships, were invented in 1884 by C. A. Parsons, of Sweden, who applied to the steam engine the principle that had long been used in constructing water wheels. The Parsons type of turbine has a series of disks mounted upon a common shaft, and alternating with parallel blades fixed within the casing of the shaft. There are buckets or cups upon both the revolving disks and the fixed blades, the fixed buckets being reversed in relation to the moving cups. The steam, admitted first through a set of stationary blades or buckets, impinges at an angle upon the first rotating disk and imparts motion, passing thence through another set of fixed blades to the second disk upon the main shaft, and thus through the entire series of alternately fixed and rotating buckets. The area of the passages increases progressively to correspond with the expansion of the steam as it is used on the successive disks. See also NAVY; SHIPS; STEAM.

Ste'arin, a glyceride or ether of glycerin ($C_3H_5(C_{18}H_{35}O_2)_3 = C_{57}H_{110}O_6$). In commercial parlance, *stearin* is a term applied to the impure stearic acid obtained by the saponification of fats in the preparation of star candles. Tristearin is the natural form of stearin in hard fats.

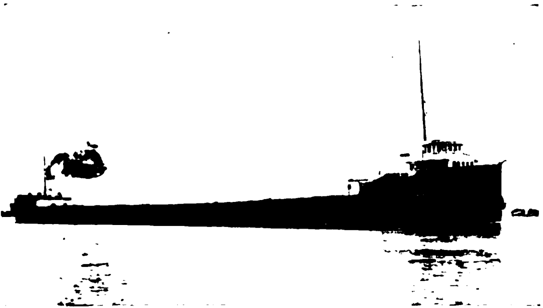
Ste'atite, or **Soap'stone,** a stone which receives both its names from its unctuous quality. It is a compact form of talc, and is an impure hydrated silicate of magnesia. It has some use in the porcelain manufacture. A soft white sort is the French chalk of the toilet and of the tailors' shops. Powdered steatite



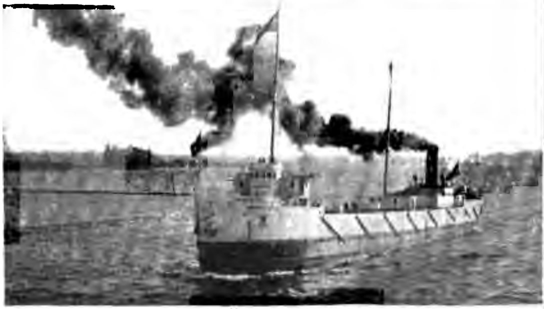
THE "GREAT EASTERN" (1857-1887).
UNTIL 1901, THE LARGEST STEAMSHIP EVER LAUNCHED. LENGTH 679 FT., 6 IN.; BEAM 82 FT., 8 IN.



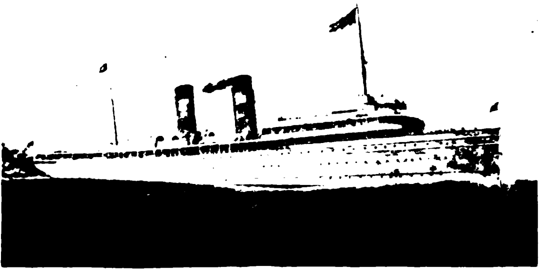
THE "SCOTIA" (1862).
LAST TRANSATLANTIC PADDLE-WHEEL STEAMER. LENGTH, 379 FT.



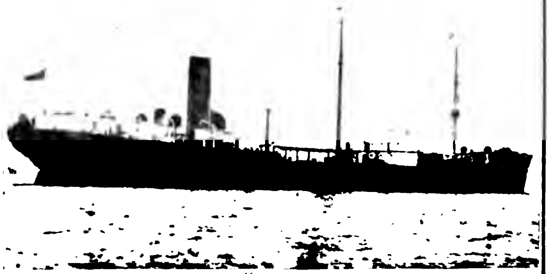
THE "J. PIERPONT MORGAN."
LAKE ORE CARRIER. LENGTH 600 FT.; BEAM 58 FT.



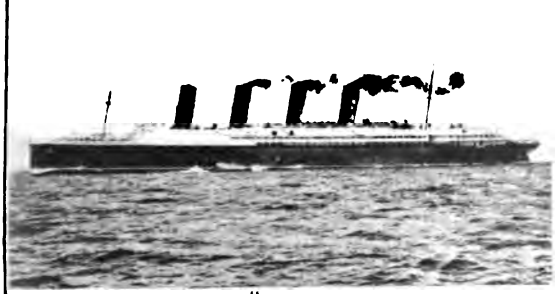
THE "CONEMAUGH."
PACKAGE FREIGHT CARRIER ON THE LAKES.



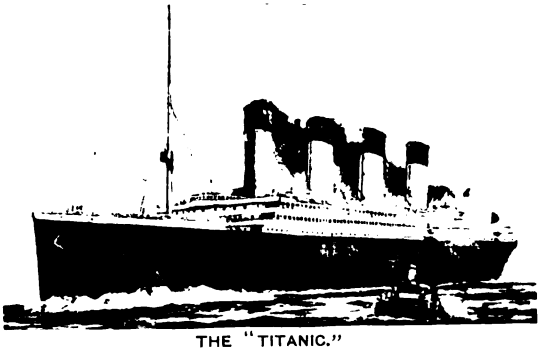
THE "NORTHWEST."
LAKE PASSENGER STEAMER.



THE "IROQUOIS."
AN OIL-CARRYING STEAMER. CAPACITY, OVER 3,000,000 GAL.



THE "LUSITANIA."
LARGEST SHIP AFLOAT IN 1909. LENGTH 790 FT.; BEAM 88 FT.; ENGINES 68,000 H. P.



THE "TITANIC."
LARGEST STEAMSHIP UNDER CONSTRUCTION IN 1909. LENGTH, 860 FT.; BEAM 92 FT.

STEAMSHIPS.

M70U

is used as a lubricant, and in steam packing. Steatite is easily cut into figures, which are then hardened by fire and colored to imitate more costly stones. Steatite is employed in making stoves and foot stoves for use in cold weather, since it retains heat. It is abundant in many parts of the U. S. and other countries.

Sted'man, Edmund Clarence, 1833-1908; American poet and critic; b. Hartford, Conn.; in 1860 was employed upon the New York *Tribune*; editor and war correspondent of the New York *World*, 1861-63; contributed to *The Atlantic Monthly* and other magazines; was in 1863 in the Attorney-general's office, Washington, and after 1865 a stockbroker in New York. Works include "Poems, Lyric and Idyllic," "Alice of Monmouth," "The Blameless Prince," and "Hawthorne." "Victorian Poets" was followed by "Poets of America," and by "The Nature and Elements of Poetry." In 1895 he brought out "A Victorian Anthology," and in 1900 "An American Anthology"; in 1905 a "History of New York Stock Exchange."

Steel, a compound of iron which has been cast from a fluid state into a malleable mass. The terms, "pot" or "crucible" steel, "open-hearth" steel, and "Bessemer" steel, are used for distinguishing processes of manufacture, but they do not necessarily distinguish between steels which differ either chemically or mechanically.

The grand structural characteristic of steel, to which it largely owes its value for all uses, is homogeneity, due to fusion. The important chemical qualities of tool steel are: (1) The tempering quality, which is due, first, to the presence of from three quarters to one and a quarter per cent of carbon; second, to the mechanical mixture of this carbon with the metal by means of slow cooling from a red heat which makes the metal comparatively soft, so that it can be cut with the ordinary tools; third, the extreme hardening of the metal when, by means of sudden cooling, the carbon is chemically dissolved in the iron. (2) Its freedom from ingredients, such as phosphorus, which cause brittleness. Excepting some modern steels, in the manufacture of which nickel, manganese, tungsten, chromium, titanium, and some other metalloids are employed, the best tool steels have but a few hundredths of one per cent of any ingredient except carbon, silicon, and iron. The more important qualities of structural steels vary with their precise uses. In general, great resistance to statical strains, or to those gradually applied, is accompanied by comparative brittleness and unfitness to resist strains suddenly applied. High resistance, resilience, hardness, and brittleness increase, up to certain limits, with the amount of impurities contained in the metal. Low resistance, softness, ductility, and toughness become more marked, within certain limits, as the impurities become less; but too little as well as too much impurity makes steel weak and unsuitable for structural purposes. It requires what is called body to give it resistance to either statical or sudden strains. This body is imparted by carbon, manganese, silicon, phosphorus, and by other ingredients; but too much of either of them, or of certain compounds of them, weakens the metal.

In the manufacture of steel the *crucible-steel process* at first consisted in melting wrought iron with carbon in clay crucibles. In the present manufacture, other ingredients besides carbon, chiefly manganese, are added. Sometimes substances intended to combine with and remove the impurities in the wrought iron are introduced, but generally these impurities remain in the steel. The finest steel must therefore be made from wrought iron which has been purified by reworking with pure fuel, and which was originally made from pure ores. The melting point of wrought iron is so high that it has been usual to carburize it in order to fuse it at a convenient temperature in crucibles. The use of the Siemens furnace and the modern improvement of crucibles render the melting of wrought iron practicable and cheap. The cheaper grades of crucible steel are largely made from Bessemer steel-rail ends and other scrap. The quantity of steel made by the crucible process is relatively small. The two processes which produce the bulk of the metal for rails, structural material, wire, nails, plates, hoops, tin plates, etc., are the open-hearth or Siemens-Martin process and the Bessemer process.

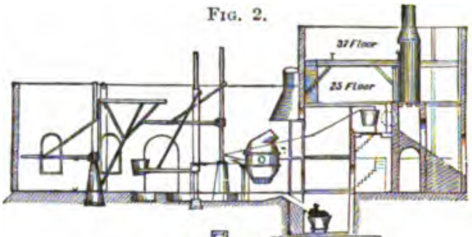
The Siemens regenerative gas furnace, by means of the intensity and uniformity of its heat, first furnished practical conditions to the *open-hearth process* (or Siemens-Martin) abt. 1862. It was also demonstrated by Martin that the addition of manganese at a certain stage was necessary to the production of sound and practically malleable steel. In the Siemens open-hearth steel furnace the hearth or bed of the furnace consists of a shallow iron tank, ventilated below to prevent the concentrated heat of the hearth and the regenerators from endangering the structure, and lined with a very refractory material, usually silica, nearly pure, and just fusible enough to set into a solid mass. The red-hot air and gas play upon the materials placed on the hearth, and pass down into the regenerators at the left end, where they give off their heat to a checker-work of fire bricks. The current being reversed after some thirty minutes, the air and gas enter at the left end through the newly heated regenerators and pass out at the right end. The design of furnaces undergoes some modifications when natural gas is used as a fuel. An important modification of the ordinary open-hearth furnace consists in placing the entire hearth on rockers, which permit of tilting the furnace. This presents important advantages in charging and in tapping the charge.

The materials employed are various, and consequently the process varies, although the decarburization of pig iron is always a part of it. In order to obtain a sufficiently intense combustion there must be a slight excess of air; the flame is therefore oxidizing, and would seriously waste wrought iron or the ingredients usually melted in crucibles. A bath of cast iron, which on account of its carbon can be melted without serious loss, is first necessary; in this are immersed and protected the more readily oxidizable materials for the production of steel. The amount of cast iron varies from ten to thirty-three per cent of the total charge. The more common process is known as the scrap process, and this again is divided into (1) the fusion of pig and scrap wrought iron or steel charged together, the former melting while the latter is heated preparatory to melting; (2) the dissolving of either hot or cold scrap in a bath of pig previously melted; (3) the dissolving of wrought-iron sponge in a cast-iron bath. The operation in all these cases is chiefly the melting of the decarburized iron forming the bulk of the charge, and the oxidation of the greater part of the carbon and silicon in the crude cast iron, and also in the basic process of the phosphorus. A portion of the iron is also oxidized, and this oxide of iron makes the product unmalleable or red short. To remove the oxygen something (for instance, manganese) must be added which has a greater affinity for it than iron. By using an excess of manganese any desired proportion of it remains in the steel. If the decarburization of the cast iron and the dilution of the carburized and uncarburized portions of the charge are carried only to such an extent that a highly carburized product remains, less manganese is needed to make it malleable. As soon as the manganese is thoroughly diffused through the bath the charge is tapped out and cast. The pig-and-ore process, as developed by Siemens, consists in decarburizing a bath of pig iron by iron ore, and then adding ferromanganese in the usual manner. The iron in the ore is added to the bath, and a little limestone is thrown in to facilitate its separation. The theory is to use ore enough to make good the waste of the iron by oxidation.

The chemical part of the *Bessemer process* may be described as the oxidation by means of air blasts of the carbon and silicon (as in the older or acid process), or of the carbon and phosphorus (as in the basic or improved process) in melted crude cast iron so as to make it malleable. During this reaction a certain quantity of iron is also oxidized. This is reduced by adding manganiferous pig iron, which reintroduces the necessary amount of carbon and also adds manganese, whose presence is useful in the subsequent rolling of the steel. The Bessemer process as first performed, and as still practiced to a limited extent abroad with irons rich in manganese, consists in applying the blast until all but one fourth to one half of one per cent of the carbon is burned out, and then casting the product. The present practice is to blow the iron until all the carbon is exhausted, but the product now, as in the open-hearth process before described, contains so much oxide of iron that it is brittle while red hot and crumbles in working. To reduce this oxide of iron, manganese is added. No phosphorus is removed from the iron in the acid Bessemer process. Only the carbon and the silicon are oxidized. It is therefore important to start with pig irons having a little less phosphorus, sulphur, and copper than the steel may safely contain; but it is not usually practicable to use irons low in silicon, for the oxidation of this element produces the high temperature necessary to keep the mass fluid. Manganese is to a certain extent a substitute for silicon in this respect, and always a valuable ingredient, but the greater part of the irons of the world do not contain it in important quantities.

A standard American Bessemer plant of a type to which many existing works belong consists (1) of a melting department, the furnace and working floor of which are shown in plan by Fig. 1; sections of these floors and the furnaces are shown by Fig. 2. (2) The converting department, shown in ground plan by Fig. 1 and in cross section by Fig. 2. The vessel in which the melted iron is treated by air blasts is illustrated by Fig. 3. (3) The engine department, which contains a blowing engine, capable of delivering air at 25-lb. pressure to the square inch. The water-pressure machinery for actuating the hydraulic machinery consists of a pair of duplex pumps. The tendency in the U. S. has been to do away with the casting pit. This is accomplished by pouring the steel into a ladle suspended from an overhead traveling crane. The steel is poured into molds standing on cars, constituting a train, so that the whole charge can be hauled out of the converting house by a locomotive soon after it is cast. A growing practice in Europe and in the U. S. is to dispense entirely with the remelting of the pig iron in cupolas. The molten pig iron as it is tapped

Fig. 2.



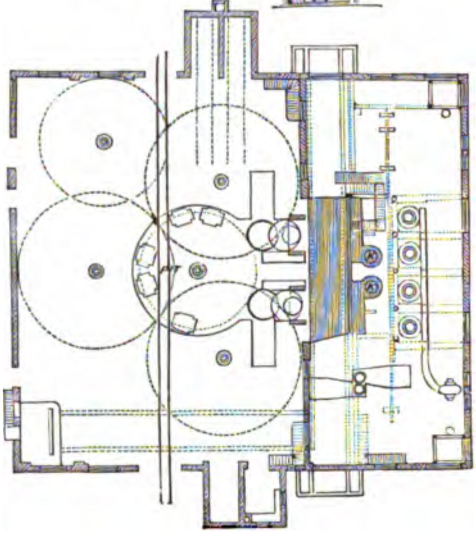


Fig. 1.

from the blast furnace is run into ladles mounted on cars. It is cast into a large vessel holding 100 to 150 tons of molten metal, called the mixer. From this mixer the iron is tapped whenever required, and in the quantities needed into ladle cars, from which it is poured into the converters direct. This is called the direct process.

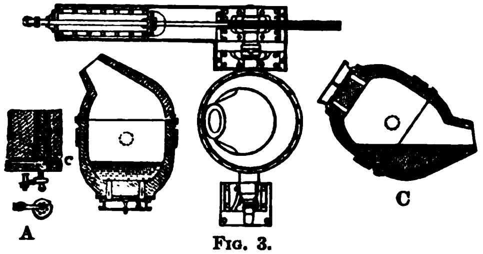


FIG. 3.
A, Tuyere (section). C, Vessel turned up to receive air blast.

The hydraulic crane generally used in works in the U. S. is illustrated by Fig. 4, and consists of a cylinder open at the top only, and requiring chiefly vertical support from the solid pier on which it rests. Since abt. 1870 open-hearth and Bessemer steel have practically displaced puddled iron in the manufacture of rails, wire, plates, structural shapes, tin plate, and cut nails, and has made heavy inroads into its field, in bars and other shapes.

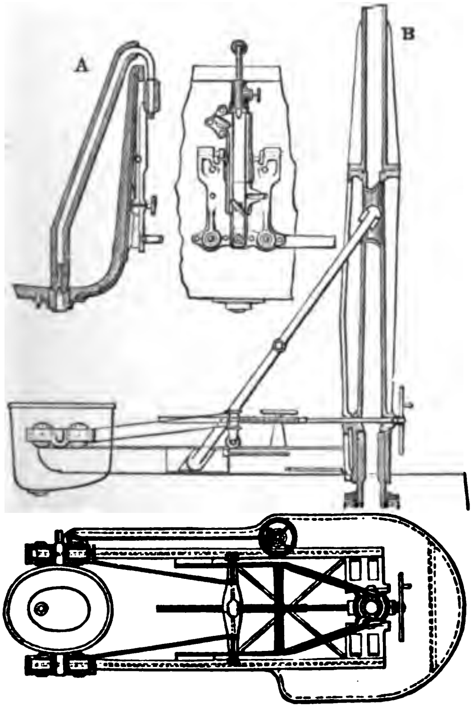


FIG. 4.
A, Ladle crane. B, Hydraulic crane.

In 1867 there were produced in the U. S. 19,643 long tons of steel; in 1907 there were 23,362,594 tons produced. See METALLURGY; IRON.

Steele, Sir Richard, 1672–1729; English author; b. Dublin; educated at the Charterhouse, London, and at Oxford. In 1695 he enlisted as a private in the Life Guards, and in the same year published "The Procession," a poem on Queen Mary's funeral. This was dedicated to Lord Cutts, who gave Steele a captaincy in the Coldstream Guards. In 1701 he published "The Christian Hero," a short manual of religious ethics, and brought out at Drury Lane his first comedy, "The Funeral." This was followed by "The Lying Lover" and "The Tender Husband." About this time he married a widow, Mrs. Margaret Stretch, who seems to have died in 1706. In May, 1707, he was appointed gazetteer. In September, 1707, he married Miss Mary Scurlock, of Llangunnor, Wales. His letters to this lady were first printed in 1787. He was always in pecuniary difficulties, but such was his amiability that he always found friends to assist him, and was successively appointed to many lucrative offices. In politics he was an ardent Whig. In 1713 he was returned to Parliament for Stockbridge, and was expelled on account of political articles written by him, but was knighted by the king, and returned to Parliament for Boroughbridge in 1715. In 1721 he brought out his successful comedy of "The Conscious Lovers."

His first wife, who died soon after their marriage, brought him a plantation in the W. Indies, and his second wife was a Welsh heiress, but he squandered his large income in dissipation and unprofitable speculations, and being attacked with a paralytic stroke, which disabled him from literary work, he retired to his estate at Llangunnor, where he died. "My life," he said, "has been spent in sinning and repenting." Several of Steele's political essays and pamphlets had a high reputation in their day, and his comedies were well received. His chief fame rests upon his connection with *The Tatler* and *The Spectator*, although in these his part was inferior to that of Addison, who was his lifelong friend. *The Tatler* (1709–11) contained 271 numbers; 188 were by Steele, 42 by Addison, and 36 by both conjointly. This was succeeded by *The Spectator* (1711–12), containing 555 numbers, of which 236 were by Steele and 274 by Addison. After the discontinuance of *The Spectator*, Steele, with the coöperation of Addison, started *The Guardian*, but Addison soon withdrew, and the work was brought to a close. Steele started other papers which were comparative failures, and he left two unfinished comedies, "The School of Action" and "The Gentleman."

Steel Engrav'ing. See ENGRAVING.

Steel'ton, Dauphin Co., Pa.; on the Susquehanna River, 3 m. E. of Harrisburg. It was laid out under the name of Baldwin in 1866; later known as Steel Works P. O., and incorporated under present name in 1880. It contains the plant of the Pennsylvania Steel Company; several flour, saw, and planing mills, and a public-school building, erected by the steel company. Pop. (1880) 2,447; (1900) 12,086, not including the suburbs of Highland, Oberlin, New Cumberland, and New Market.

Steel'yard, or Ro'man Bal'ance. See WEIGHING MACHINES.

Steen (stān), **Jan,** 1636–89; Dutch painter. He painted about 300 pictures, combining all the elements of genuine low comedy. In the museum at The Hague is his well-known "Representation of Human Life."

Stee'ple Chase. See HORSE RACING.

Stein (stīn), **Heinrich Friedrich Karl** (Baron von), German statesman, 1757–1831; b. Nassau-on-the-Lahn; studied jurisprudence at Göttingen, 1773–77; entered the civil service of Prussia, 1780, and was made chief of the department of commerce, manufactures, and indirect taxation, 1804. He was dismissed, January 4, 1807, but recalled after the Peace of Tilsit (July 20, 1807), and made president of the cabinet. He developed astonishing energy. His reforms were a reorganization of the Prussian state. Serfdom was abolished, and universal obligation of military service introduced; manorial estates were taxed, all citizens made equal before the law, a liberal municipal system established, and on the crown lands the system of peasant proprietorship was introduced. His final aim was to elevate the peasant class and to create a powerful and intelligent middle class, and, with the nation reorganized on this basis, to renew the contest with Napoleon. He had also a clear idea of what a united Germany meant, and was averse to the division of the country into petty states. An incautious letter, in which he criticized the policy of Napoleon and spoke of his own plans, fell into the hands of the French police.

On November 24, 1808, Stein was compelled to resign, and, on December 16th, Napoleon outlawed him and confiscated his property. He went to Austria, thence to Russia, but once again he was at the head of the political affairs of Germany during the period between Napoleon's disaster in Russia and the Peace of Paris, when he actually was the leader of the diplomatic coalition against France. His influence soon became small. The German princes hated him for his ideas of a German unity; the absolutists hated him for his ideas of a representative government; and he himself was unwilling to adopt the impracticable views of the radicals. He retired to his estates, and died at Kappenberg, Westphalia.

Stein'bock, any one of several species of the family *Bovidæ*. (1) The German designation *Steinbock* (and hence the Dutch *steenbok*) was originally conferred on the ibex or bouquetin of Europe, a species of goat, and to that animal the name properly belongs. (See BOUQUETIN.) (2) The Dutch settlers of S. Africa applied the name to an antelope peculiar to that region. It is the *Nanatragus tragulus*. The steinbok is an animal of graceful and symmetrical form, with the head well proportioned, having a bovine nose and large muffle; the legs long and slender, and the tail very short. The color is a fulvous ash above and on the sides, and white beneath. The length is less than 3½ ft., and the height at the shoulder about 1½ ft. The species is most abundant on stony plains and in valleys, and especially on open flats, where large stones and clumps of trees are found. It is very swift, and progresses by great bounds. It is also very timid and readily alarmed. It is much esteemed for its flesh.

Steinmetz (stīn'mĕtz), **Karl Friedrich von,** 1796–1877; Prussian military officer; entered the Prussian army 1813 and fought against the French; made his name illustrious as commander in chief of the Fifth Army Corps in the campaign against Austria in 1866. On June 27, 28, and 29, 1866, he made a stand at Nachod, Skalitz, and Schweinshädel with his corps and one brigade against three corps of the enemy, defeated them, drove them back, and took 11 guns and 6,000 prisoners. By this victory he made it possible for the Second Army to debouch, on which maneuver the success of the Prussian battle plan depended. In the war against France, 1871, he was at the head of the First Army, but, having in some way conflicted with the plans of Von Moltke, he was (September, 1870) made Governor of Posen and Silesia, and removed from the theater of war; the King, however, declined to accept his resignation, and (April, 1871) he was made general field marshal.

Stem, a term of historical grammar denoting that part of a word which is left when the inflexional ending is removed.

Stem. See BOTANY.

Stenog'raphy, systems of brief writing, whether written, printed, or published, previous to the invention of phonography, or writing by sound, invented by Isaac Pitman, 1837, and which is now almost universally used in all English-speaking countries.

Dr. Young (1584–1682) and Champollion (1791–1832) endeavored to prove that the Egyptians, from their threefold form of writing, had a kind of tachygraphy. Diodorus having said that "the King of Egypt was bound by a certain law to have before him a daily report of the state of affairs over the length and breadth of his kingdom," some believed the Egyptians used shorthand. There are passages in the Bible (Jer. xxxvi, 4, 18; Ps. xlv, 1, and Ezra xiv, 24, etc.) which tend to show that the Hebrews had abbreviated writing. These are merely conjectures. Xenophon (445–355 B.C.) is given credit by Diogenes Laertius for having first taken down the sayings of Socrates (470–399 B.C.) in notes (ὑποσημειούμενος). To impart a shorthand meaning such as that contained in the well-known Greek word "tachygraphy" is overstraining that original term. In a letter written by Flavius Philostratus, 195 A.D., is found the first undoubted mention of a Greek shorthand. It is probable that in the century before Christ some kind of writing briefer than the common was practiced by the Greeks, but existing examples of tachygraphy date only from the tenth century.

Tachygraphy appears to have been taught in Roman schools, and many distinguished men, among them Emperor Titus (40–81 A.D.), used a method of brief writing. In early Christian times tachygraphy was employed in taking down the words and sermons of the bishops of the Church. In the ninth and tenth centuries these brief notes—initial Greek and Roman letters and contractions—were used by the revisers and annotators of the texts of MSS. They appear to have gone out of general use about this time.

There are still existing an inventory and fifty-four charters of Louis the Pius of France in the characters of the Tironian system. In the time of Frederick II (1482–1556) shorthand was confounded with the Armenian or diabolical characters, and books and MSS. were burned. From the reign of Louis XIV (1654) until the present there have been a multitude of treatises on the art of writing "as quickly as one speaks." The system most in use by practical French reporters is that of Duploye. Isaac Pitman's shorthand has been adapted to the French language. From the middle of the seventeenth century until 1832 there was no reliable German system of stenography. Franz Xaver Gabelsberger (1789–1849) in 1817 planned his system, but it was fifteen years before he found a publisher. It was at first crude, but subsequent editions contained improvements which entitled it to first rank in Germany. In 1900–1 its practitioners claimed 30,560 pupils attending 1,087 schools, and being instructed by 1,243 professors. The Prussian Chamber is the only exception to the official use of the Gabelsberger shorthand in Germany.

There is no country in Europe where shorthand is so extensively practiced as in England. In 1902 it boasted the creation of 498 distinct systems. Nearly all the earlier ones are worthless catchpenny pamphlets. In 1588 Dr. Timothy Bright published "Characterie: The Art of Short, Swift, Secret Writing." It was dedicated to Queen Eizabeth, and all others were forbidden to print the same. Peter Bales in 1590 published .the art of "Brachygraphy." Both these efforts are not now considered worthy the name of stenography. John Willis is regarded as the founder of alphabetic shorthand. The first edition appeared in 1602. From this date to 1700 appeared forty distinct alphabetic systems. From 1700 to 1800 there were twenty-seven systems published. From Crome (1801) to Selwyn (1847) forty-one systems are recorded. These make no pretentions to phonetics, and, with the exception of the modified and improved systems of Byrom and Taylor, which are still used by a few old practitioners, have passed out of practical use. Systems based on phonetic shorthand alphabets—consonants and vowels—are: Tiffin, 1750; Lyle, 1762; Holdsworth, 1766; Roe, 1802; Isaac Pitman, 1837; and De Stains, 1839. Of these, only the Isaac Pitman system survives, which has become practically universal for correspondence and reporting.

In the U. S. previous to 1845 there were many unsuccessful attempts to invent practicable shorthand systems. Most prominent among these were those of Day and Stetson and Charles Saxon. In the early days of the republic modifications of the systems of Byrom and Taylor were most used. Thomas S. Malone arranged a new set of consonant signs, took Duployé's vowel arrangement, and called it "Script Phonography." Being unsuccessful in England, it was transferred to the U. S. Since the introduction and failure of "Script Phonography," other systems—five in all—having the same vowel basis, have been published, the most vigorously pushed being that by Kingsford, entitled "Oxford Shorthand," and by Gregg, called "Light-line Phonography." See PHONOGRAPHY.

Steph'anus, or **Stephens** (stĕ'vĕns), French, ÉSTIENNE or ÉTIENNE, name of a French family of printers of the sixteenth and seventeenth centuries. HENRY, the founder of the family (b. abt. 1465, d. abt. 1520), established a printing house in Paris in 1502, and published mathematical and theological works. His sons, FRANCIS (1502–50), ROBERT I (1503–59), and CHARLES (abt. 1505–64), were largely engaged in printing. Robert in his twentieth year published an edition of the Latin New Testament. In 1531 he began the publication of his "Dictionarium, seu Thesaurus Linguæ Latinæ," which he improved in two subsequent editions, and which is still in use. He published at least eleven complete editions of the Bible, in Hebrew, Greek, Latin, and French, besides many separate editions of the New Testament and 382 other works. He first introduced the existing division of the New Testament into verses. His brother Charles succeeded to his business, and was printer to Henry II. His publications are numerous. HENRY, son of Robert (1528–98), was a profound student of Greek literature. He carried on business successively in Paris and Geneva, but suffered severe financial losses by the publication of his "Thesaurus Linguæ Græcæ." PAUL (1566–1627), son of Henry, succeeded his father at Geneva, and ANTHONY (abt. 1592–1674), his son, for fifty years conducted a printing house in Paris, and died in poverty.

Ste'phen, Saint, the first Christian martyr; one of the seven deacons in the Christian congregation of Jerusalem. Charged by the Jews with speaking against the law and against God, he was stoned to death by order of the Sanhedrin. (Acts vi and vii.) His festival is held on December 26th, both in the Eastern and Western churches.

Stephen I, Saint, King of Hungary. See HUNGARY.

Stephen, the name of ten popes. Some historians count but nine, from the circumstance that Stephen II died three days after his election, March 27, 752, before he had been consecrated. The following bearers of the name are the most noteworthy: STEPHEN I, Saint, pope from abt. 254–257 A.D.; is noted for his controversy with Cyprian as to the necessity of rebaptizing converted heretics. The councils of Carthage (255 and 256) having decided against the Roman practice of recognizing baptism by heretics as valid, Stephen broke off communion with the African Church. STEPHEN III (II), pope from 752–757, suffered severely from the aggressions of the Lombards. After asking in vain for help against them from the Byzantine emperor, Constantine Copronymus, he went in person to Pepin le Bref, chief of the Franks, whom he crowned king on the condition that he should expel Aistulf, the Lombard king, from the exarchate of Ravenna and the Pentapolis, and bestow these territories on the see of St. Peter. Pepin made two campaigns in Italy, but succeeded at last in forcing the Lombards to retreat from the above territories, which he then gave to the papal see, in spite of the protest of the Byzantine emperor, thereby laying the foundation of the temporal power of the pope. STEPHEN VII (VI) (896–897) is most noticeable for his violence in respect to his predecessor Formosus, whose corpse he caused to be exhumed, stripped of the papal insignia, mutilated, and thrown into the Tiber, annulling all his ordinances, and even his consecrations. STEPHEN X (IX) (1057–58), son of the Duke Gotelon of Lower Lorraine, and elected pope through the influence of Cardinal Hildebrand, afterwards Pope Gregory VII.

Stephen, abt. 1100–1154; King of England; the last of the Anglo-Norman line. His father was Stephen, Count of Blois, and his mother was Adela or Adelicia, daughter of William the Conqueror. Henry I, his maternal uncle, procured his marriage to Matilda, heiress to the Count of Boulogne, as early as 1114. After Henry's death, while deliberations as to his proper successor were in progress in Normandy, Stephen hastened to England, and was crowned, December, 1135. At first his government was fairly successful, but his reign was a period of war and tumult, the most miserable in English history. He was involved in contests with the Welsh, who inflicted defeat and loss on the English. In the war that was renewed with Scotland in 1138, the English gained the battle of the standard, August 22d. The cause of the Empress Matilda, Henry's daughter, was early taken up by a party in England, headed by her natural brother Robert, Earl of Gloucester; and, September 30, 1139, Matilda landed in England. Stephen was defeated and made prisoner, February 2, 1141, at the battle of Lincoln. The greater portion of the country submitted to the victors, but Matilda's arrogance caused a speedy reaction. Robert of Gloucester was defeated and captured in September, 1141, and was exchanged for Stephen. At the battle of Wilton, July 1, 1143, Gloucester was victorious, and the king fled. In 1153 Henry, son of Matilda, defeated Stephen at Malmesbury; but leading men now interposed to make peace, and under the Treaty of Winchester (or Wallingford), November 7, 1153, the throne passed on Stephen's death to the house of Plantagenet in the person of Henry II.

Stephen, Sir James Fitzjames, 1829–94; English jurist; called to the bar, 1854; as member of legislative council of India, 1869, he made important contributions to codes of evidence and criminal procedure. Judge of Queen's Bench Division, 1877–91. Wrote "History of the Criminal Law of England," "Liberty, Equality, and Fraternity," digests of evidence and criminal law, and many monographs.

Stephen, Leslie, 1832–1904; English author; brother of the preceding, educated at Eton, King's College, London, and Cambridge. He edited *The Cornhill Magazine*, 1871–72, resigning to take charge of the "Dictionary of National Biography," the first twenty-six volumes of which he edited. Among his writings are "The Playground of Europe," "Free Thinking and Plain Speaking," "Hours in a Library," "History of English Thought in the Eighteenth Century," "The Science of Ethics," "An Agnostic's Apology," besides biographies and an edition of Fielding.

Ste'phens, Alexander Hamilton, 1812–83; American statesman; b. Georgia; admitted to bar, 1834; member Georgia Legislature, 1836–42; member of Congress, 1843–59. He vigorously opposed the secession ordinance at the convention at Milledgeville, January 16, 1861, but was a member of the congress which met at Montgomery in February, and was elected vice president of the Confederacy; May 11, 1865, he was arrested and sent to Fort Warren in Boston harbor, but, October 11th, was paroled. Member of Congress, 1872–82; then Governor of Georgia.

Ste'phenson, George, 1781–1848; English engineer; b. Wylam, Northumberland, the son of a colliery laborer; was successively engine boy, fireman, and enginewright. In 1814 he constructed the first operable locomotive. In 1815 he originated the steam blast and devised a miner's safety lamp still used in England. Sir H. Davy, however, received the prize of £2,000 offered for such a lamp, Stephenson receiving £100. A subscription of £1,000 was, however, later raised for him. The first railway built by him, opened in 1822, 8 m. long, was so successful that he was thereafter almost incessantly engaged on new roads. In 1824, with Edward Pease, he opened locomotive works at Newcastle-upon-Tyne. In 1825 he was principal engineer of the Liverpool and Manchester line, on which he overcame great engineering difficulties. He prevailed on the directors to offer a prize of £500 for the most effective locomotive engine; and at the trial, October 6, 1829, his engine the "Rocket," constructed by himself and his son Robert, was adjudged to be the best. At the opening of the road, September 15, 1830, eight locomotives constructed at the Stephenson works were employed. His life has been written by Samuel Smiles.

ROBERT (1803–59), his son, a railway engineer. For many years he was employed in constructing railways and other engineering works at home and abroad. Among his most remarkable works are the high level bridge over the Tyne at Newcastle, the viaduct over the Tweed valley at Berwick, the Conway bridge, and the Britannia tubular bridge across the Menai Straits. He also designed an immense bridge across the Nile at Kaffre Azzayat, and the first great tubular bridge across the St. Lawrence near Montreal. From 1847 till his death he was a member of Parliament. He published "Description of the Locomotive Steam Engine," "Report on the Atmospheric Railway System," and "The Great Exhibition, its Palace and Contents." His life has been written by Smiles, and also by J. C. Jeaffreson and W. Pole.

Steppe (stĕp), the name given by the Tartars to the plains of central Asia. They are usually covered with grass, and correspond in their aspects and relations to the prairies of the U. S. and the llanos and pampas of S. America.

Steppe-mur'rain. See RINDERPEST.

Stere. See METRIC SYSTEM.

Ste'reo-chem'istry, a branch of chemistry that has to deal with the relations which the atoms bear to one another in space. The ordinary methods of investigation of chemical compounds lead to certain conclusions in regard to the connections existing between the atoms in a molecule. Thus when water is expressed by the formula HOH, no attempt is made to tell anything about the arrangement in space of the two atoms of hydrogen and the atom of oxygen. The formula expresses the view that each of the two atoms of hydrogen is linked to the atom of oxygen, but the question whether they are on the same side or on opposite sides, above or below, is not touched. Yet it is certain that if these atoms exist and are united in the molecule they must be arranged in space, and a formula that does not take into consideration the three dimensions of space is certainly incomplete. Up to within a comparatively short time no facts were known that justified any speculation concerning the space relations of atoms, but it appears that the time has come when such speculation is profitable, and facts are constantly being brought to light that cannot be explained without its aid. See CHEMISTRY.

Stereop'ticon. See MAGIC LANTERN.

Ste'reoscope, an instrument by aid of which the two eyes view two different pictures of the same object and combine them into one having the appearance of solidity. This illusion is produced by presenting to each eye a picture in perspective as it would appear to each, which can readily be accomplished by means of photography. It is said that such a stereoscope was conceived by Prof. Elliot, of Edinburgh, in 1834, but was not constructed by him till 1839, after Sir Charles Wheatstone had in 1838 invented and exhibited his reflecting stereoscope. In Wheatstone's instrument the observer looks with each eye into a separate mirror, the two being inclined at an angle of about 45°, which reflect the images of pictures placed one on either side. In 1849 Sir David Brewster invented a refracting stereoscope, which is more convenient than Wheatstone's. The open stereoscope common in the U. S. was devised in 1861 by Dr. Oliver Wendell Holmes. In this the two pictures are placed side by side, separated by a partition, and viewed through two lenticular prisms which slightly magnify them and combine them into one.

The illusions of the stereoscope are explained by the fact that binocular vision gives us the perception of solidity or the third dimension of extension in all objects not over 200 ft. distant from the eyes; for in the stereoscope we have the images formed on the retina of the right eye and of the left similar to the images that would be formed in the eyes if real solid objects were before us, having the sizes and the situations that they appear to have in the stereoscopic illusion in the instrument; also, the axes of the eyes are inclined to each other in the same manner when looking in the stereoscope as they would be if they regarded the abovementioned group of solid objects. Hence the eye is affected exactly as when it views these real objects, and a stereoscopic perception is the effect. If the pair of pictures be transposed, that intended for the right eye being put for the left, the effect is a reversal of the relief foreground points appearing to be in the background.

Ste'reotyping and Elec'trotyping, the process of making metal plates, reproducing in facsimile the surface of engravings or type. Stereotypes are of type metal throughout; electrotypes have a facing, usually of copper, deposited by electricity.

There are three methods of stereotyping—plaster, clay, and papier-maché. Only the last named is now much employed, and by it plates can be made in less than six minutes. The type is placed in a steam-heated press in contact with a sheet of papier-maché, which forms the matrix. When the matrix is dry, metal is poured upon it, and the resulting plate, when trimmed, is ready for the printing press. In the chalk-plate process a sheet of steel is covered thinly with soft material, like chalk, which is scraped away where lines are to show, leaving the steel bare. The plate is then used as a matrix. In electrotyping, a wax mold is first made from the engraving or type and powdered graphite is spread over its surface, so as to make it a conductor of electricity; copper may then be deposited on it by the ordinary process of electroplating. For glyphography a sheet of copper is blackened on one side and then covered with a waxlike composition. Wherever the wax is scraped, the black surface is seen, and shows what an electrotype printed from the plate will be. See ELECTROTYPE.

Sterne, Laurence, 1713-68; English humorous author; b. Clonmel, Ireland. He was a parish clergyman of Yorkshire and a prebendary of York Cathedral. His "Tristram Shandy" took an extraordinary hold upon the public, and Sterne ranked with Fielding, Richardson, and Smollett as a great writer of prose fiction. In 1760 and 1766 appeared four volumes of sermons. In 1767 he wrote the first and only part of "The Sentimental Journey," his best work. In 1775 his daughter Lydia published three volumes of his "Letters to His Friends," and in the same year appeared "Letters to Eliza," consisting of ten letters addressed by Sterne in 1767 to "Mrs. Elizabeth Draper," and another collection of letters in one volume. He was a subtle delineator of character, and his chosen province was the whimsical. His views are kindly, but his works are mostly corrupt.

Steth'oscope, an instrument employed by physicians for the physical exploration of the chest. Laennec, the founder of methodical auscultation, introduced the solid stethoscope, a tube made from a single piece of wood (Fig. 1). It is from 10 to 12 in. long, has a flanging chestpiece to receive sound, an open canal to convey sound, the solid structure also serving to conduct it, and a broad, flat earpiece for apposition to the ear and the exclusion of extraneous sounds. This has now been replaced by the "binaural" or "double stethoscope" (Fig. 2). For careful diagnosis, by concentrating local sound, and conveying a separate but similar and simultaneous impression to each ear, the stethoscope is invaluable. In the phonendoscope the sound is increased by a plate of hard rubber at the end in contact with the patient.

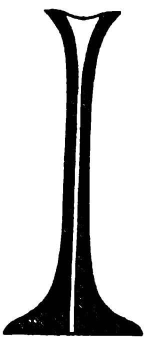


FIG. 1.

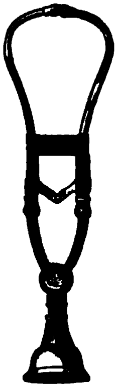


FIG. 2.

Stettin (stĕt-tĕn′), capital of province of Pomerania, Prussia; on the Oder, 83 m. NE. of Berlin. The site it occupies is hilly, and the houses are neat and substantial. Its sugar refineries, oil mills, glassworks, breweries, distilleries, and manufactures of anchors, sailcloth, rope, tobacco, soap, candles, hats, etc., are important, and Stettin is the third port of Germany; its port on the Baltic is Swinemünde. Stettin was a flourishing member of the Hanseatic League. It forms the outlet for the rich products of Silesia. Pop. (1905) 224,119.

Steuben (stoi′bén), **Friedrich Wilhelm August Heinrich Ferdinand** (Baron von), 1730–94; American soldier; b. in Prussia. He entered the Prussian army in 1747, and distinguished himself at Prague and Rossbach (1757), at Kay and Kunersdorf (1759), and later at the siege of Schweidnitz. Received special instruction in tactics from Frederick the Great. In 1764 the Prince of Hohenzollern-Hechingen made him grand marshal and general of his guard. In 1777 he volunteered in the American army under Washington, and during the winter reached Valley Forge. On May 5, 1778, he was appointed inspector general with the rank of major general, and in June he was at the battle of Monmouth. He prepared a manual for the army, which was approved by Congress in 1779, and introduced the most thorough discipline. In 1780 he was a member of the court-martial on Major André; afterwards commanded the troops in Virginia, and in January, 1781, harassed the British under Benedict Arnold. Later he was attached to Lafayette's division, and served in the siege of Yorktown. In 1790 Congress voted him a life annuity of $2,500. Several of the states voted him tracts of land, New York presenting him with 16,000 acres near Utica. Died at Steuben, N. Y. He was a man of great kindness and generosity, of ready wit, and polished manners.

Steu′benville, capital of Jefferson Co., Ohio; on the Ohio River. It is in a rich agricultural and mining region; is laid out on the second terrace of the Ohio, above danger from the floods, for which the river is noted, and is nearly surrounded by hills from 300 to 500 feet high. Pop. (1906) 14,925.

Ste′vens, Thaddeus, 1792–1868; American statesman; b. Peacham, Vt.; graduated Dartmouth College; went to Gettysburg, Pa., where he taught school and studied law; admitted to the bar, 1816, and soon acquired an extensive practice. In the presidential canvass of 1828 he was a strong opponent of Jackson; in 1833 and several times later he was a member of the state legislature, and in 1836 a member of the convention to revise the state constitution. He was active in introducing the public-school system in Pennsylvania. In 1848 was elected a member of Congress; was reëlected 1850, 1858, 1862, and thereafter to each Congress until his death, serving as chairman of important committees, being one of the acknowledged leaders of the Republican Party, and distinguishing himself for his advocacy of measures in opposition to slavery, for the emancipation and enfranchisement of the negroes, and after the war for stringent proceedings against the seceding states. He was one of the most active managers in the impeachment trial of Pres. Johnson. Died in Washington.

Ste′venson, Adlai Ewing, 1835– ; Vice President U. S., 1893–97; b. Christian Co., Ky.; admitted to the bar, 1858; member Congress, 1875–77; again nominated for Vice President in 1900 on Democratic-Populist tickets.

Stevenson, Robert Louis Balfour, 1850–94; English author; b. Edinburgh, Scotland. He was admitted to the Scottish bar, but did not engage in practice. He first attracted attention by "An Inland Voyage" and "Travels with a Donkey." These were followed by a series of romances—"New Arabian Nights," "Treasure Island," a tale of buccaneers and buried treasure and one of the best boys' books; "Prince Otto," a love story; "The Strange Case of Dr. Jekyll and Mr. Hyde," a psychological romance, and the most popular of Stevenson's fictions; "Kidnapped," a novel with historical elements and studies of Scottish character types quite equal to Scott's; "The Merry Men and Other Tales," a volume of short stories in a variety of keys; "The Master of Ballantrae"; "The Wrecker" (with Lloyd Osbourne); "David Balfour," a sequel to "Kidnapped," etc. Stevenson's versatility is shown in his "A Child's Garden of Verses," a very imaginative, poetic representation of the world from the childish point of view, and in various volumes of travel, criticism, miscellaneous essays, and sketches such as "Virginibus Puerisque," "Across the Plains," "The Silverado Squatters," and "Memories and Portraits." He traveled much in search of health, and many of his books were written in a sick bed, on railway journeys, or at sea. For years he resided at Samoa and elsewhere in the S. Sea Islands, reporting his observations in " A Footnote of History," "Island Nights' Entertainments," etc. In an age of realism Stevenson brilliantly advocated the claims of romance both by practice and by theory. Died Vailima, Samoa.

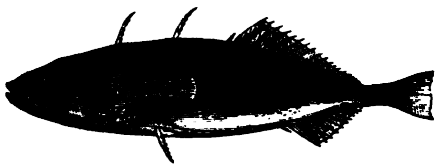
Stewart, Balfour, 1828–87; English physicist; b. Edinburgh. Director at Kew, 1859; Prof. of Natural Philosophy, Owens College, Manchester, 1870. He discovered the law of equality between the absorptive and radiative power of bodies. Joint author of " Researches in Solar Physics" and of a religio-scientific treatise, "The Unseen Universe." Also wrote many popular text-books.

Stewart, David (Duke of Rothesay and Earl of Carrick), 1377–1401; son of Robert III, King of Scotland; became lieutenant of Scotland, subject, however, to the advice of his council, of which his uncle, the Duke of Albany, was a member. He defended Edinburgh against Henry IV of England, 1400, but was soon after seized by the opposite party and imprisoned in Falkland Castle, where he died by starvation.

Steyn (stīn), **Martinus Theunis,** 1857– ; President Orange Free State. Called to the bar, 1882; State Attorney, 1889; then raised to the bench. President of the republic, 1896. Coöperated with the Transvaal to resist the British, and after Pres. Kruger's departure was in command of the fighting forces.

Stick'ing Plas'ter, or **Adhe'sive Plaster,** an article for surgeons' use, made of resin, lead plaster, and soap, melted together and spread by machinery upon stout muslin. Light adhesive plasters, court-plasters, and the like are made of silk or goldbeater's skin, covered with a solution containing isinglass and gum benzoin, and backed with a varnish of Chian turpentine and benzoin. See Court Plaster.

Stic'kleback, a small fish of the family *Gasterosteidæ,* having the back armed with stout spines, whence the popular name. The species rarely exceed 6 in., and are generally much less. Although so small, they are nevertheless extremely pugnacious and voracious, and attack without hesitation animals many times larger than themselves.



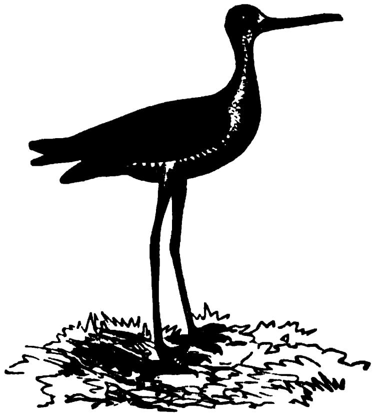
Two-spined Stickleback.

Stig'ma, certain abnormal appearances which mark a degenerate person, such as irregular teeth or ears, or deformed palate; or functional derangement, such as epilepsy or deafmutism.

Stigmatiza'tion, in the literature of the Roman Catholic Church the miraculous impression upon certain saints of marks similar to the five wounds of Christ (stigmata) or of the crown of thorns. Instances are those of St. Francis of Assisi (September 15, 1224) and Veronica Giuliani (1694). Many persons, among whom was St. Catharine of Siena, are said to have felt at regular intervals the pain of such wounds, but without any external mark.

Stilicho (stĭl'ĭ-kō), **Flavius,** abt. 359–408; Roman general; the son of a Vandal officer of cavalry under Valens. For his services as an envoy to Persia in 384 Theodosius gave him the hand of Serena, his adopted daughter. Stilicho became master general of the army, and in 394 Governor of the West as guardian of Honorius. Theodosius died in 395, leaving to Honorius the Empire of the West and to Arcadius that of the East. After establishing peace on the border, Stilicho turned toward the East, ostensibly against Alaric, but really to break the power of Rufinus, Governor of the East, whom he intensely hated. He was stopped by a message from the Byzantine court, but he procured the assassination of Rufinus (395). In 398 a marriage was celebrated between Stilicho's daughter Maria and Honorius. In 403 Stilicho twice defeated Alaric, and in 404 received a triumph in Rome. In 405 Italy was invaded by Radagaisus with a swarm of Vandals, Suevi, Burgundians, Alans, and Goths; and although he was defeated and slain (406) and his troops sold as slaves, a portion of his horde ravaged Gaul, from which Stilicho had been obliged to withdraw the garrisons. This caused indignation, and Stilicho's power at court was secretly undermined by the eunuch Olympius, who represented to Honorius that he meditated his death. Stilicho took refuge in a church in Ravenna, but was soon brought out and slain.

Stilt, a name applied to birds of the genus *Himantopus,* related to the avocet. They are distinguished by excessively long legs, a straight, slender bill, which is slightly compressed, feet with the middle and outer toes connected by a small web and destitute of a hind toe, and tail projecting beyond the wings. Six species of the genus are recognized as in-



Black-necked Stilt.

habitants of various parts of the world. One species is found in America, and ranges from the N. U. S. to Paraguay.

Stim'ulants, those agents which increase functional activity of the various organs of the body, especially of the respiration, circulation, and nervous system. Such are, preëminently, strongly nourishing hot food, if it can be digested; if it cannot, then alcoholic or ethereal potions, ammoniacal solutions, heat, strychnine, etc.

Sting Ray, of the genus *Trygon*, a group belonging to the order *Raiiæ*. They have the body rhombic and moderately broad, skin smooth and without tubercles, nasal valves coalescent into quadrangular flaps, teeth flattened, and the tail long, tapering, destitute of a true fin, and armed with an elongated spine (sometimes with two) compressed from before backward, with teeth or serratures at each side directed downward. These spines are the "stings." There are about thirty species found in tropical and temperate seas, and are much dreaded on account of the wounds they inflict with their spine-bearing tail. They can whip the tail around with great ease and transfix the incautious intruder with the spines.

Stir'ling, capital of Stirlingshire,. on the Forth; 35 m. NW. of Edinburgh. It contains a fine old castle. The town and its vicinity are rich in historic associations. Tartans, shawls, rope, soap, leather, and malt are manufactured. Pop. (1901) 18,403.

Stir'lingshire, county of Scotland, forming the borderland between the Highlands and the Lowlands; area, 447 sq. m., of which about two fifths is under cultivation. The W. part of the county is mountainous, and rich in iron, coal, and freestone. The highest peak is Ben Lomond, 3,192 ft., near the foot of which lies Loch Lomond. Agriculture, cattle breeding, mining, and the manufacture of cotton and woolen goods, chemicals, etc., are pursued. The ironworks at Carron are among the largest in the country. Stirlingshire is rich in historic associations, and boasts of many battle fields, the chief of which are Stirling Bridge, Falkirk, Bannockburn, and Kilsyth. Pop. (1901) 142,291. County town, Stirling.

Stoat. See ERMINE.

Stock Exchange', an association of brokers in shares, bonds, or other securities of corporations, nations, states, counties, or municipalities, and in negotiable certificates representing commodities of trade. Until the decade 1880–90 the last-mentioned instruments were not regularly dealt in by stock exchanges. The Petroleum and Mining Exchange of New York City was, however, in 1885, expanded into an exchange for stocks, oil, and mining shares, and the older New York Stock Exchange shortly afterwards admitted to regular trading on its board the so-called "pipe-line certificates" of the petroleum market, and later certificates of deposited silver bullion, through which the price of silver might be made a convenient speculation.

Membership in a stock exchange is usually limited, and as, in a number of exchanges, a "seat" is the property not only of an active broker, but also of his heirs or assignees, the privilege represented by it possesses a marketable value. Memberships in the New York Stock Exchange have sold as high as $60,000 (in 1901) and as low as $15,250, the record of 1893. The purchase of a seat from a previous incumbent does not of itself entitle the buyer to the privilege of trading on the floor. He becomes a member only after formal application and by the approval of the committee on admissions. Stock exchanges are governed by strictly enforced by-laws, covering rules for general management, mutual arrangement and enforcement of contracts, and requirement of personal business honesty and good behavior. On the New York Stock Exchange an insolvent member is suspended until he has settled with his creditors, and may be readmitted only on proof of such settlement and on the formal vote of the committee on admissions, or, if rejected by them, on appeal to the general governing committee. Suspension or expulsion is also fixed as penalty for (1) the making of fictitious sales; (2) the making of fictitious or trifling bids or offers; (3) the buying or selling of securities for a less commission than that fixed in the by-laws; (4) "obvious fraud"; (5) refusal to comply with any other regular provision of the by-laws.

In nearly all stock exchanges no security can be dealt in on the floor unless it has been officially admitted by the committee appointed for the purpose. Securities may also be expressly excluded. The only exception to this privilege of exclusion, in European stock exchanges, is the public stock of the nation to which the exchange belongs. In London a rule forbids trading in public loans raised by nations at war with Great Britain. For the "listing" of new securities on the New York Stock Exchange the applicant company must show to the committee on stock list that the shares or bonds in question were regularly issued, and that they have been actually marketed. A general financial statement at a date not too far distant must accompany the application. In the case of shares, the securities must be registered with a trust company satisfactory to the stock exchange. In the case of bonds, evidence must be submitted that the mortgage was properly drawn and recorded. These stringent provisions were the result of numerous frauds and "overissues" of securities in the earlier history of American stock speculation. On the New York Stock Exchange the regular minimum commission is one eighth of one per cent on outside orders, one thirty-second of one per cent on orders given by fellow members, and one fiftieth of one per cent where a member has merely employed a fellow member to make the bargain, delivery being made to or by the real purchaser or seller. All commissions are reckoned on a security's par value. A broker is forbidden under a penalty to sell stock at a price lower than the best bid made in his hearing for the amount in question or to buy at a price higher than the lowest offer. This is to prevent unfair "manipulation."

In all stock exchanges actual delivery of securities sold is required, the one apparent exception being in cases where mutually balanced contracts are canceled through the stock exchange clearing house. The common assumption that trading on stock exchanges involves no real sale, purchase, or transfer, but is merely a species of gambling on differences, is wholly erroneous. This species of gambling is confined to the "bucket shops," private concerns with no stock exchange membership, and which neither receive nor deliver actual securities, merely paying to customers or receiving from them the money balance due between the stock-exchange price at the time of the fictitious sale or purchase and at the time the contract is closed. In the U. S. these institutions are illegal in most states, and are raided by the police as common gambling houses.

Trading in stocks has for nearly two centuries been characterized by a set of terms and phraseology peculiar to itself. A "bear" is a market operator working to cause lower prices. A "bull," conversely, is working for higher prices. Both of these terms are at least as old as England's S. Sea speculation of 1720. The bear is usually said to be "short" of stocks. The origin of this more modern term is plain, and signifies that the operator has sold stocks which he does not yet own, for delivery at a fixed future date. The price may or may not be lower than previous recorded quotations. Usually he receives his payment, at current prices, on the spot, and in modern stock exchanges he also makes his delivery of stocks on the spot. But the stock thus delivered is borrowed from real holders, to be repaid when the "short" seller "covers"—that is to say, when he buys outright in the market to close his contracts. The bull is commonly "long" of stocks in a speculative way. This term signifies that he buys the stock and pays for it in money on the spot, but borrows the money for payment. When he sells his stock, at a profit or otherwise, he repays the loan. It often happens, therefore, that when the bear is borrowing stocks and the bull borrowing money, the one is simply lending to the other. Sales by the bulls are currently called liquidation. Stocks are said to be "carried" when a banker advances money to the bull speculator, retaining the stocks as security for the loan. The "carrying rate" naturally varies, therefore, with the rate of money and the demand for stocks. "Pools" are combinations of operators devoting their joint resources to the manipulation of a single security or group of securities. The manipulation is usually directed by one member of the pool. Contracts for such purpose have in some cases been recognized as legal by the courts, but appeal to law is rarely made, and bad faith, such as the "selling out on his associates" by one member of a "bull pool," is not easily proved against the offender.

A "put" is a contract drawn by a capitalist or broker and sold at a specified sum to a speculator, in virtue of which the speculator may, within a fixed period, deliver the stock to the issuer of the put and be paid for it at a stipulated price. The buyer of a put is, of course, usually a bull, and buys the put to guard himself against losses on a possible decline. A "call" is the reverse of a "put." Its issuer contracts to sell to the buyer of the call, at or before a stipulated date, a certain amount of a certain stock at a fixed price. The bear buys this to guard against unexpected advances. A "spread" or "straddle" combines the features of both put and call, contracting at the option of its buyer to deliver to him or receive from him a fixed amount of securities named, the limits of price being set as many points apart as the situation, in the view of the issuer, will justify. All of the contracts described are generally classed as "options" or "privileges." A "wash sale" is a transaction in stocks wherein buyer and seller do not permanently transfer the securities at all, but work in a common interest to create semblance of activity and affect prices. In most stock exchanges "wash sales" are forbidden under heavy penalty, but they are difficult of detection and undoubtedly play a large part in current stock transactions. Two expressions in stock-exchange dialect, frequently used in cable dispatches, are peculiar to London. "Contango," a word probably derived from the continental expression for "contingent," refers to the rate or percentage charged an operator long of stocks for carrying over his account to the next fortnightly settling day. "Backwardation" is an etymological barbarism describing the premium, if any, charged to a short operator for permitting him to defer delivery from one settling day to the next. Its equivalent on the New York Stock Exchange is the premium charged in the "loan crowd," where actual owners of stocks are lending the shares to bear operators desirous of making present deliveries.

Stock'holm, capital of Sweden, is built upon the mainland and several islands at the outlet of Lake Mälar in the Baltic, and has been called the "Venice of the North." In the island of Staden is the royal palace (built 1697–1754), one of the most beautiful in Europe. The islands have been enlarged by embankments built on piles, whence the name Stockholm, meaning an island on piles. The Swedish kings are crowned in the old St. Nicholas Church. The Djurgaard, or deer park, occupying almost an entire island about 3 m. in circumference, and containing the Rosendal Palace, is one of the numerous pleasure grounds. The industry is considerable, especially in tobacco, leather, linen and cotton fabrics, iron, sugar refining, etc. Navigation is closed each year for about five months, during which the harbor is covered with ice.

The town was founded toward the end of the twelfth century by Knut Erikson, and given the rank of city in 1255 by Birger Jarl; 1389 it was taken by Margrethe, Queen of Denmark; October 14, 1471, the Swedes, under Sten Sture, defeated the Danes at Brunkeberg and drove them out of the country; but in 1520 they again took the city under Christian II, and the Stockholm massacre took place; by the general rising which resulted, Gustavus Vasa established himself on the throne. During the peaceful times of the nineteenth century the prosperity of the city, like that of all Sweden, has much increased. Pop. (1907) 337,460.

Stock'port, in Cheshire, England; at the confluence of the Mersey and the Tame; 6 m.

SSE. of Manchester. It is irregularly built on rugged and uneven ground across a gorge. It is an important seat of the cotton industry, and has also breweries, foundries, machine shops, etc. Stockport was the site of a Roman station, and afterwards of a Norman castle, which was destroyed during the parliamentary war. Pop. (1908) estimated at 102,339.

Stocks, a wooden apparatus formerly much used in Europe for punishing petty offenders and vagrants. It consisted of two heavy timbers placed one above the other, with notches so arranged that when the upper timber, which was movable, was shut down in place and fastened, holes were formed in which the ankles of the offender were secured. There were sometimes other holes for the hands, and in some cases a hole for the neck. Stocks were first introduced into England probably about the time of the statute of laborers, 23 Edward III (1350), which provided that they be erected in every town, and by subsequent statutes this punishment was inflicted for minor offenses of various kinds down to very recent times. In the U. S. they were used to punish slaves. Stocks may still be seen in some villages in England.

Stocks.

Stock'ton, Francis Richard, 1834–1902; American humorist; b. Philadelphia; applied himself to wood engraving and to literature, contributing illustrations to *Vanity Fair* and other periodicals, and issuing stories for children, such as "The Ting-a-Ling Stories," "Tales out of School," etc. He was employed successively upon the Philadelphia *Post*, the New York *Hearth and Home*, *Scribner's Monthly* (afterwards *The Century Magazine*), and *St. Nicholas*. The first of his books to attract general notice to him, as a humorist of a new and original vein, was "Rudder Grange." This was followed by "The Lady or the Tiger?" "The Late Mrs. Null," "The Casting Away of Mrs. Lecks and Mrs. Aleshine," "The Dusantes," "The Merry Chanter," and many others.

Stockton, capital San Joaquin Co., Cal.; on an arm of the San Joaquin River, 100 m. E. by N. of San Francisco. The fertile San Joaquin Valley is tributary to Stockton. The water supply is from artesian wells. The average temperature is 40° in winter and 75° in summer. The city was laid out in 1849 by Charles M. Weber, who owned a large tract of land under a Mexican grant; first became important as a point of departure for gold-mining parties, and has since prospered as a commercial and wheat-distributing center. Pop. (1906) 30,000.

Stod'dard, Richard Henry, 1825–1903; American journalist and poet; b. Hingham, Mass.; became a mechanic in a foundry; contributed poems to periodicals, and in 1849 privately printed "Footprints," a small volume of poems, followed in 1852 by a larger volume; 1853–73, he held appointments in the New York customhouse and dock department; literary editor the New York *World*, 1860–70, and in 1880 became literary editor of the New York *Mail and Express*. His writings include "Adventures in Fairy Land," "Songs of Summer," "Town and Country," "Life, Travels, and Books of Alexander von Humboldt," "The King's Bell," "The Children in the Wood," in verse; "Abraham Lincoln, a Horatian Ode"; "Putnam the Brave," "The Book of the East," and "The Lion's Cub," poems.

Sto'ics (literally, belonging to the Porch, derivation of *Στοά ποικίλη*, the Painted Porch at Athens, in which the Stoics were wont to gather), an ancient philosophic school founded abt. 310 B.C. by Zeno of Citium in Cyprus (flourished abt. 350–258), and which for centuries exercised a great and good influence upon the stronger minds, especially of the Romans.

The Stoics attached great importance to what they called a criterion of truth, though they were never able to fix upon any that would satisfy them. They regarded force and matter as inseparable, much as they are by modern physicists. They believed in a periodical return of the universe to primeval fire, which was, of course, incompatible with the resurrection of the body. The individual, as a mere temporary emanation, returns at last to his source. But it was its ethics rather than its logic or physics which gave stoicism its practical importance.

In their ethics the Stoics, if not altruistic, were essentially unselfish—they rigidly maintained that the end of life was virtue for virtue's sake. What virtue was they found it difficult to define, their "living agreeably to nature" being vague, not to say that they sometimes made nature mean human nature, sometimes universal nature. Man exists for society, for only in that is virtue possible. Virtue is sufficient for happiness; and pleasure, which naturally accompanies activity, is not to be sought for its own sake. The cardinal virtues are practical wisdom, courage, self-restraint, and justice, and it requires the possession of them all to constitute the truly wise man, who is free and the equal of Jupiter himself. The Stoics drew a broad distinction between acts and motives, and made the moral quality of acts depend entirely upon motives. Man shall do that which is good independently of surrounding influences and circumstances, and, having done that which is good, he shall feel happy independently of the sufferings and misery which may result from his acts.

Stoke-upon-Trent, Staffordshire, England; on the Trent; 16 m. N. of Stafford. It is the capital of the potteries district, producing earthenware, porcelain, encaustic tiles and pavements. Coal mining and brick making are carried on, and engines, machinery, etc., are made. Pop. (1901) 30,450.

Stom'ach, organ for the reception of food, its disintegration and solution, and the digestion of albuminoid matter. The stomach is situated on the left side of the body, below the diaphragm, behind and beneath the ribs. It is a membranous bag, capable of great distention, but often flaccid and collapsed. When full it is 12 in. long and 4 high. The stomach receives food from the esophagus through its upper or cardiac orifice. The greater curvature of the stomach is the lower, convex surface; the lesser curvature is concave and above. Food leaves the stomach through its lower orifice, the pylorus, and enters the duodenum, the first section of the small intestine.

The stomach has four coats: (1) The external serous layer, covering it at all points except the entrance of the nutrient vessels and nerves in the great and small curves. (2) The muscular layer, which has three sets of fibers—the longitudinal, the circular, and the oblique. These muscular bands, acting in different directions, propel the contained food from side to side of the cavity. (3) The cellular coat, consisting of loose areolar tissue, connects the muscular to the internal mucous coat. It is called also the submucous coat and the vascular coat, as it contains the blood vessels which supply the elaborate capillaries. (4) The mucous coat, thick, especially at the lower or pyloric end, presents large longitudinal folds when the stomach is but partially filled or empty, which disappear when it is distended. Closely inspected, the mucous surface is found to be perforated by innumerable closely aggregated orifices of the gastric tubules. These are of two kinds: (1) the peptic glands situated in the cardiac and central parts of the organ, and (2) the pyloric situated at the pyloric end. The stomach is constantly lubricated by secreted mucus, which may become excessive in digestive disorders. Gastric juice is chiefly secreted after the taking of food. By branches of the sympathetic nervous system the functional activity of the stomach is influenced by the health of each organ and part of the body; it receives the terminal branches of the pneumogastric nerve, which gives off branches controlling the action of the heart, lungs, and in a measure the larynx and pharynx. It is by these connections that gastric indigestion may cause palpitation of the heart, difficult and sighing breathing, irritability of the larynx, and hoarseness, and by reflex influence many morbid sensations in various parts of the body.

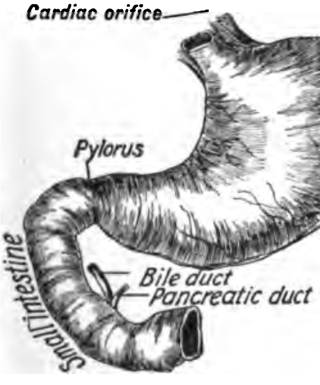


FIG. 1.—THE STOMACH.

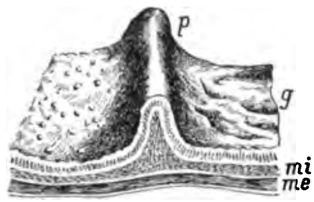
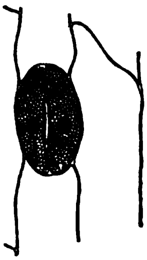


FIG. 2.—THE THREE COATS OF THE STOMACH. *g*, inner surface mucous membrane; *mi*, circular layer of muscular fibers; *me*, outer layer of longitudinal muscular fibers; *p*, ridge of pyloric ring.

The most frequent diseases of the stomach are its functional disorders. Acute inflammation or gastritis is of rare occurrence, the result of violent mechanical or chemical irritation, swallowing corrosive poisons or putrid and acrid food. It is characterized by violent ejection of all food, gastric mucus, traces of blood and bile, by local burning pain, feeble pulse, cold extremities, and collapse. Perforating ulcer of the stomach is a not-infrequent disease in young women of anemic character. The symptoms are pain in the stomach upon reception of food, its rejection, and hemorrhage when the ulcerative process has eroded a blood vessel. Cancer of the stomach is a relatively common affection of old persons, particularly of males. Cases of entire removal of the stomach for cancer or other cause show that this organ is not essential to life.

Stomach Pump, a syringe with a flexible tube, designed to be passed down the esophagus into the stomach, after which water is injected through it into the stomach and then withdrawn by reversing the action of the syringe. The operation may be repeated until the stomach is clear of its contents. The instrument is useful in removing poisons. In case of insane persons, or where some disease of the mouth or esophagus exists, artificial feeding is required, and is usually done with a simple rubber tube, which may also be used as a siphon for washing out the stomach.

Sto'mata, breathing pores in the epidermis of plants, each stoma consisting of two elongated, curved cells, the guard cells (*g* in figure), between which is a definite opening. When the guard cells curve away from one another, as they do when the atmosphere is moist, the slit between them is opened, permitting the free ingress and egress of gases. They rarely occur on submerged parts of plants, and in leaves which lie upon the surface of the water they are confined to the upper side. In ordinary leaves they are usually more abundant upon the lower side.


A STOMA.

Stone, Thomas, 1743–87; signer of the Declaration of Independence; b. Maryland. He was a lawyer; delegate to Congress, 1774–76; served on the committee to prepare a plan of confederation, reëlected to Congress, 1777 and 1783.

Stone. See BUILDING STONE; CONCRETE CONSTRUCTION.

Stone, in Great Britain, 14 lb. avoirdupois, though other stones are 24 lb. of wool, 8 lb. of meat, 16 lb. of cheese, etc.

Stone (in pathology). See CALCULUS.

Stone, Age of, the stage of development in which people used tools and weapons of stone. It does not refer to general chronology, but to a period in the development of each race. Thus certain races of the S. Sea islands and the extreme N. belonged to the Stone Age in the nineteenth century. It seems probable that in all parts of the world men have passed through this stage before making use of metals. In Europe the Stone Age is divided into the Palæolithic and Neolithic. The remains of the former consist exclusively of flint, and roughly shaped by clipping into rude forms. The Neolithic implements include axes, hammers, knives, etc. These are made of various stones, some finer specimens being of jade, often highly polished.

Stone'henge, a collection of huge stones on Salisbury Plain, Wiltshire, England, originally arranged so as to form two ovals within two circles, surrounded by a bank of earth 15 ft. high and 1,010 ft. in circumference. It is now much defaced. There are about 140 stones, weighing from 10 to 70 tons. Scattered over the plain are about 300 tumuli, or barrows, some of which have been opened and found to contain charred human bones, fragments of pottery, and British and Roman ornaments and weapons. According to Geoffrey of Monmouth, Stonehenge was erected by order of Aurelianus Ambrosius, the last British king, in honor of 460 Britons slain by Ilengist the Saxon. Some believe it to have been a druidic temple, and others that it was a place of both worship and of council, but later archæologists regard it as a burial place of the people of the Bronze Age.

STONEHENGE.

Stone Li'ly, a crinoid having the form of a lily. See CRINOIDÆ.

Stone Riv'er, Bat'tle of. See MURFREESBORO.

Stone'worts, the *Characeæ*, an order of lower plants, allied to the red seaweeds and mossworts. They are small, green aquatic plants with jointed stems, bearing whorls of leaves. Both stems and leaves are very simple, often no more than a row of cells, but sometimes a cylindrical mass of cells. The sexual organs, which occur upon the leaves, consist of antherids and carpogones. Fertilization takes place by the entrance of the antherozoid through the opening in the coronula, and its fusion with the oösphere, which then acquires a thicker wall. This ripened spore fruit soon falls to the bottom of the pond, and after a period of rest germinates by sending out a jointed filament, which eventually gives rise to a branching plant again. The stoneworts number about 150 species. In N. America there are about sixty-two species, widely distributed in ponds and slow streams.

Ston'y Point, town; Rockland Co., N. Y.; at the head of Haverstraw Bay; on the W. side of the Hudson River; 42 m. N. of New York City. It is on a rocky promontory, which was fortified early in the Revolutionary War, was captured, strengthened, and garrisoned by the British, retaken by the U. S. forces under General Wayne in a night attack, July 16, 1779, and soon afterwards the fortifications were destroyed and the place abandoned. The summit contains a lighthouse and fog-bell tower. The house in which Arnold held his treasonable interviews was destroyed by fire in 1892. Remains of the fortifications are still preserved. The site was acquired as a national reservation in 1897. Pop. (1905) 3,862.

Stop'page in Tran'situ (*in transitu* = Lat., in passage), in law, stopping goods while they are in transit, and resuming possession of them by an unpaid seller, who has parted with their possession. The seller is allowed to exercise this right upon discovering the insolvency of the buyer, on the ground "that the goods of one man should not be applied in payment of another's man's debts."

Stor'age Bat'teries, also called accumulators or secondary batteries, are voltaic cells for the storage of electrical energy. Voltaic cells may be divided into two classes: primary and secondary. A primary cell consists of two chemically different metals, such as zinc and copper, placed in a vessel or jar containing an acid solution called an electrolyte. This combination will give a current of electricity whenever the metals are connected by a conductor. This current, the energy of which is obtained by the combination of one of the metals with the acid part of the electrolyte, will continue to flow until the supply of metal and electrolyte is exhausted. The products of the chemical reaction must then be removed and fresh material supplied before the cell can be brought into activity again.

In the storage battery or secondary cell the necessary difference between the two metals is brought about by the direct action of the current flowing through the cell. The current employed for this purpose, which is called the charging current, has a portion of its energy transformed into potential energy of chemical combination, in which form it may be said to be stored—hence the term storage battery. After the charging process has gone on for a sufficient length of time the cell may be taken out of the circuit, its terminals metallically connected, and it may thus be made to give current just as any primary cell would do. This current, which is called the discharging current, flows in the opposite direction from the charging current. The amount of energy which may be obtained from it can never exceed the total energy stored in the cell by the action of the charging current, but under the best conditions it may approach very near to the latter in amount.

A storage battery does not in reality store up electricity; but by electrochemical action it stores up energy, which is supplied to it in the form of electricity, and which it will return in the same form, giving, when charged, a current like an ordinary primary battery. The ordinary storage battery consists of plates of lead covered with lead salts, placed in a cell containing dilute sulphuric acid. When the current passes from plate to plate in changing, the lead sulphate, formed by the action of the acid, becomes spongy metallic lead at one plate and brown lead dioxide at the other. When the battery discharges, the dioxide is again reduced to lead sulphate, and a similar action takes place with the spongy lead. By passing a charging current through the cell again the plates are restored to their original condition.

There are two varieties of storage-battery plates, known as the pasted and the Planté. In the Planté plates the active material is formed by certain chemical actions on the lead plate itself. In the pasted plates, known also as the Faure, the active material is made up in quantities and applied to a perforated lead plate called a grid. The capacity of a battery is usually given in ampere hours, meaning that a battery will discharge a given number of amperes for a certain number of hours. A battery discharging ten amperes continuously for five hours would be said to have a capacity of fifty ampere hours. A new type of storage battery invented by Thomas A. Edison uses nickel steel in place of lead, thereby gaining considerably in lightness—a great consideration. Storage batteries are made in many sizes and of different designs to suit the purposes for which they are required. They are much used for running electric launches and automobiles and to supplement a dynamo, from which they may store enough energy to be expended at intervals when the dynamo is insufficient or at rest.

Stork, any bird of the genus *Ciconia* and of the family *Ciconiidæ,* which contains half a dozen species, all—save *C. magnari*—inhabitants of the Old World. In general appearance they resemble the European stork (*C. alba*). This is a large bird, 3½ ft. long; the head, neck, and body above, as well as below, are white, the wings partly black, and the bill and legs red. It is a migratory species, which in the warm season extends into N. Europe, and in winter (as well as other seasons) is found in N. Africa and Asia. It has no cry, but claps its bill together with a loud noise. Storks are great favorites with the people, who conceive that their presence brings good luck. They often build upon the roofs of houses. They devour offal, reptiles, and other vermin. The stork displays remarkable affection for its young, and is of old a popular emblem of filial piety and conjugal faithfulness. See also Shoebill and Shadow Bird.

White Stork.

Storm, an intense atmospheric disturbance, which may be general or local, and may be characterized by high winds, when it is of especial importance to navigators, or by heavy precipitation of rain or snow, when it is most important inland, or by both wind and precipitation. General storms are areas of low pressure ("lows," or cyclones) of intense action, which travel eastward in temperate latitudes, but westward in the tropics. In summer very few of the "lows" are sufficiently intense to deserve the name of storm; in winter, perhaps, half of them are stormy, and in spring and autumn the ratio is still larger.

Stormy weather increases in frequency from the tropics toward the poles. The ocean in the vicinity of Cape Horn has the reputation of being the stormiest sea in the world, but the N. Atlantic is the stormiest frequented ocean. The Pacific Ocean deserves its name only in lower latitudes. About the Aleutian

Islands and S. of Australasia it is very stormy. In the U. S. the storm frequency is greatest in New England and the region of the Great Lakes. Next come the extreme NW. and the Atlantic coast. The most destructive general storms in the U. S. are of tropical origin (see HURRICANES), but they affect only the E. part of the country and occur only in late summer and autumn. The general storms which enter the U. S. from the W. Gulf coast or Mexico in the colder seasons bring warmer weather with abundant precipitation, sometimes torrential rains. Most of the general storms which affect the E. part of the U. S. appear first in sight on the plains E. of the Rocky Mountains, in Alberta or Assiniboia. The American storms which last long enough to cross the Atlantic usually pass northward of the British Islands. A few pass over Great Britain, or sometimes pass farther S., over France, or even Spain.

The approach of a general storm is heralded by a falling barometer, a rising thermometer (generally), and a sheet of clouds ascending from the W. and preceded by long, filmy streaks of cirrhus. These signs usually give a day's notice, and the weather map a notice of two or three days. The storm lasts from one to three days; the maximum of rainfall and wind usually precede by a few hours the minimum of air pressure; and the retreat of the signs of the storm is more rapid than their advance with the approaching storm. The official forecasts of general storms can be made with more accuracy than those with moderate changes of weather, and their approach is heralded by storm signals and warnings. A general storm occupies an area of about 500 m. in diameter, and may live from three days to a fortnight.

While the advance of the general storm can be forecasted with fair accuracy a day or two beforehand, the same is not true of local storms. They are small, are not of long duration, travel but short distances, occur usually in warm weather, and only in the hottest part of the day. In the U. S. local storms usually occur in the warm season a few hundred miles to the southward of a large, moist, and warm "low," especially when this is closely followed by a sharp fall of temperature. In the tropics they have no association with general areas of low pressure, but have a marked diurnal periodicity. For instance, at San José, Costa Rica, in the rainy season there is rain two days in three, and the rain is always after noon. Nine tenths of the rain there falls between 2 P.M. and 7 P.M.

Storm'y Pe'trel, or Storm Petrel. See MOTHER CAREY'S CHICKENS.

Sto'ry, Joseph, 1779–1845; American jurist; b. Marblehead, Mass. He was several times elected to the Massachusetts Legislature, and in 1808 to Congress; 1811 he was appointed Associate Justice of the U. S. Supreme Court; 1829, Prof. of Law in Harvard, and he afterwards resided in Cambridge. His works comprise "Commentaries on the Constitution of the United States," "Commentaries on the Conflict of Laws," "Commentaries on Equity Jurisprudence," and "Equity Pleadings," and various treatises, which have passed through many editions.

Story, William Wetmore, 1819–95; sculptor and author. He studied law, and published a "Treatise on the Law of Contracts" and a "Treatise on the Law of Sales of Personal Property," and three volumes of reports of case in the U. S. Circuit Court. Among his other publications are two volumes of poems (1847 and 1856); "Roba di Roma, or Walks and Talks About Rome"; "A Roman Lawyer in Jerusalem"; "Nero, an Historical Play," and "Castle St. Angelo and the Evil Eye, being Additional Chapters to 'Roba di Roma.'" After 1848 he resided in Rome, devoting himself to sculpture. Among his works are a sitting statue of his father, in marble, in the chapel at Mt. Auburn; statues of George Peabody, Josiah Quincy, and Edward Everett; busts of Lowell and Theodore Parker, and many ideal works.

Stoth'ard, Thomas, 1755–1834; English painter and designer; b. London; apprenticed to a designer of patterns for the silk trade, but soon became an illustrator of books, and finally a painter. Elected Fellow of the Royal Academy in 1794, and its librarian in 1812. His illustrations for books number more than 4,000, among them being those for "Robinson Crusoe" and "The Pilgrim's Progress," 1788; the "Rape of the Lock," 1798; the works of the German poet Gessner, 1802; Cowper's poems, 1825, and Rogers's "Italy" and poems. He made many designs for goldsmiths. Among his best paintings are the "Canterbury Pilgrims," "Flitch of Bacon," "Four Periods in a Sailor's Life."

Stovaine', a synthetic product, the hydrochlorate of δ-dimenthylamino β-benzoyl pentanol, discovered by Ernest Fourneau, a French chemist whose name, translated into English, is "Stove." It is not, as many think, a derivative of cocaine. It is not as poisonous as cocaine; it takes three times as much stovaine as cocaine to kill a guinea-pig. As a local anesthetic it is considered by many as good as cocaine. Prof. Thomas Jonnesco, a Roumanian, of the medical department of the Univ. of Bucharest, has recently brought this anesthetic prominently before the American public. Stovaine's local anesthetic properties are applied by its injection in solution into the spinal canal. The discoverer of spinal anesthesia was Dr. J. Leonard Corning, of New York City, who at that time, 1885, used the then only available drug, cocaine.

Stove, an apparatus for retaining and diffusing heat, as for warming and ventilating or cooking. In the Middle Ages stoves, constructed of brick or tiles, were used for warming dwellings. They were large, and in Scandinavia their broad, flat surfaces were sleeping places. The fire was kindled at the bottom, and the heat and smoke passed through flues into the chimney. Some of these stoves had ovens and flues for cooking, and when once thoroughly heated required feeding but once in twenty-four hours. Cardinal Polignac, in France, constructed fireplaces with hollow backs, hearths, and jambs of iron, and Des Aguliers modified Polignac's fireplaces so as to use them for coal. Neither these, nor the Holland stoves, which were introduced soon after (plain box stoves, with a small smoke pipe or flue at the top, and a single door, into which the wood or coal was thrown), became popular in England, owing to the prejudice of the people in favor of open fires. Franklin's stove was a great advance. Although, in its ordinary use, a fireplace, it was capable of being closed, and had a downward draught, distributing the heat through the air boxes in its sides, till at last the remainder of the heat escaped with the smoke through a flue leading into the base of the chimney. A register or "damper" of sheet iron was introduced into the descending flue, which checked and controlled the fire. In 1771 and later Franklin invented other stoves. Between 1785 and 1795 Benjamin Thompson (Count Rumford) devised several improvements in stoves, intended to economize fuel and heat.

In the U. S. before 1825 the use of stoves, generally of the box pattern and very rude, was confined to shops and offices, public rooms, and churches in cities and larger villages. In the country the churches were seldom warmed, but the women carried foot stoves and the men protected their feet by stout overshoes, called "boxes." Among the wealthy in cities cannel and other English coal ("sea coal") was burned in imported grates or in the Rumford stove, lined with fire brick. A greater number in cities and larger villages used the Franklin stove, burning wood and making an open fireplace of it. The rest of the world used the old open, capacious fireplace, burning wood logs. Until 1835 stoves in the U. S. were heavier and ruder than now and had loose and imperfect joints. Most of them were made in New Jersey, Pennsylvania, and Ohio, though a few were cast quite early in the furnaces at Cold Spring and Warwick, N. Y., and at Salisbury and Canaan, Conn. Stoves for heating purposes were either box stoves, made on the old German plan, an oven being sometimes added, placed directly over the fire, or portable and partly open fireplaces made on Franklin's plans. For cooking purposes Count Rumford's cooking stoves or ranges, lined with fire brick or soapstone, and with a ventilating oven, which had been introduced in New York as early as 1798 and into Boston about 1800, were gradually coming into use. Anthracite coal was destined to create a revolution in stoves. Jordan L. Mott and James Wilson, both of New York, made self-feeding stoves between 1827 and 1831 that would burn the British coals, and were an improvement on previous inventions; but it was not until 1833, when Mr. Mott had demonstrated that an anthracite fire could be made successfully from nut and pea-sized coals, and that the depth of the column of coal in his self-feeders must be in direct proportion to its size, the largest coal requiring the highest column, that anthracite-coal stoves became salable. The first cooking stoves made in Albany (1835) were of the old ten-plate oval pattern, with oven above the fire and a single hole on the top. These were followed by the saddlebag pattern, having the oven in the middle over the fire and the stove collar and pipe over it. The next pattern was the horse block (so called from the rear portion of the stove, which contained the oven, being a step higher than the front). The rotary stove, having a movable top, revolved by means of a crank, so as to bring any desired vessel directly over the fire, was a later invention. Then came the buck stove, both for wood and coal, having the fire above the oven and reversible flues, which carried the heat and flame around, behind, and below the oven.

In cooking stoves and fixed and portable ranges the number of inventors and manufacturers is large. The efforts of the stove makers since 1850 have been directed rather toward completing the adaptation of the principles of base burning, hot-air feeding, and the anticlinker arrangement to stoves and greater accuracy and perfection of the castings than to the discovery of any new principles. Portable and brick-set ranges in great variety are now produced, with similar arrangements for heating water as in the cooking stoves. They are well constructed, have all the improved facilities for labor and fuel saving, and are particularly noteworthy for the perfection of their castings and finish.

While the use in the U. S. of cast iron has continued for heating stoves and the majority of cooking stoves, there has been a growing application of steel in the construction of cooking ranges. Since 1885 an important development has been in the use of gasoline as a fuel. At first such stoves were made so as to burn the gasoline direct, but in the newer forms, called process stoves, the gasoline is first changed into gas. Kerosene has also been used as a fuel. The employment of illuminating gas as a fuel is steadily growing, and in cities improved burners and cheapened gas have led to the introduction of many forms of gas stoves for use in apartments. The use of electricity as a heat producer is recognized, and forms of heating apparatus for it have been devised, but as yet its employment is not large. All the stoves used in the U. S. are of domestic manufacture. In the U. S. in 1905 there were seventy-nine establishments, having a total capital of $9,981,711, for the manufacture of gas and oil stoves; the value of products, including repairing, was $7,723,697.

Stowe, Harriet Elizabeth (Beecher), 1811-96; American author; daughter of Lyman Beecher; b. Litchfield, Conn. At thirteen she was sent to the school kept by her sister Catherine at Hartford, where she studied and taught until 1832, when she removed to Cincinnati; married, 1836, to Rev. Calvin E. Stowe, then professor at Lane Seminary, Cincinnati. In 1849 she published "The Mayflower, or Sketches of the Descendants of the Pilgrims," and in 1851 began in *The National Era* of Washington a serial to illustrate the horrors of slavery, which was published separately in 1852 as "Uncle Tom's Cabin," and attained a rapid and almost unparalleled success at home and abroad. Within five years 500,000 copies were sold in the U. S.; within ten years there had been made from it two or three French versions and more than a dozen German ones. It was also translated into Danish, Swedish, Portuguese, Spanish, Italian, Welsh, Russian, Polish, Hungarian, Wendish, Wallachian, Armenian, Arabic, Romaic, Chinese, and Japanese. It has been repeatedly dramatized. It did more than any other literary agency to rouse the public conscience against slavery. In 1853 she put forth a "Key to Uncle Tom's Cabin," in which was set forth the main facts upon which the story was based, together with many incidents in corroboration of its truthfulness.

In 1850 Mrs. Stowe removed to Brunswick, Me., where her husband was a professor in Bowdoin College; 1852 they went to Andover, Mass., where he had accepted a chair in the theological seminary. In 1853 she accompanied her husband and her brother to Europe, and upon her return published "Sunny Memories of Foreign Lands." Her subsequent writings, mostly inferior, usually first appeared in periodicals, especially in *The Atlantic Monthly* and in *Hearth and Home*, of which she was for a time one of the editors. Among these are "Dred," later published as "Nina Gordon"; "The Minister's Wooing," "The Pearl of Orr's Island," "Agnes of Sorrento," "Oldtown Folks," "Pink and White Tyranny," "My Wife and I," "Bible Heroines," "Poganuc People," "A Dog's Mission," and a volume of religious poems. Her paper in *The Atlantic Monthly*, "The True Story of Lord Byron's Life," started an unfortunate scandal, and she replied to her critics with "Lady Byron Vindicated: a History of the Byron Controversy." In 1864 Mrs. Stowe removed to Hartford, Conn., where she died July 1, 1896.

Strabis'mus. See SQUINTING.

Stra'bo, abt. 54 B.C.–abt. 24 A.D.; Greek geographer; b. Pontus, Asia Minor. He traveled in Syria, Egypt, Crete, Greece, and Italy, and wrote "Historical Memoirs," which are lost, and a "Geography" which embodies the geographical knowledge of his age.

Stradivarius (strä-dĭ-vä'rĭ-ŭs), **Antonio,** 1644–1737; Italian maker of musical instruments; b. Cremona, Italy; learned the art of making violins and other string instruments from Nicolo Amati, under whom he worked for several years; in 1668 began to make violins marked with his own signature, and by degrees not only rivaled, but even outshone his master. His best instruments were made between 1700 and 1725, and command from $1,000 to $3,000.

Straf'ford, Thomas Wentworth (Earl of), 1593–1641; English statesman. He was elected to Parliament in 1614, was made Baron and Viscount Wentworth in 1628, and was the most trusted adviser of Charles I. He was appointed Lord President of the Council of the North, and in 1632 Governor of Ireland, where his administration was severe and unjust, but advanced the material prosperity of the people. He aimed at the establishment of his system of "thorough," or the absolute power of the King, and he acquired the designation of "the Wicked Earl." In 1640 he was created Earl of Strafford and appointed Lord Lieutenant of Ireland. In the same year Charles put him in command of the army against the insurgent Scots, before whom the royal troops fled, panic-struck, after the rout at Newburn (August 28th); and contrary to the strenuous advice of Strafford, the King accepted the terms imposed by the Scots. In November articles of impeachment were presented against Strafford, who was accused of an attempt to subvert the liberties of the country. His guilt is placed beyond a doubt by later evidence, but it could not then be proved, and the House abandoned the original impeachment. A bill of attainder was passed, and the King, by Strafford's own advice, but in violation of an express pledge to him, signed a warrant for his execution. His attainder was reversed under Charles II.

Straits Set'tlements, a British crown colony in the E. Indies, including Malacca, Penang or Prince of Wales Island, with the province of Wellesley, the Dindings, and Singapore. The Settlements were made a separate dependency of the British crown in 1853 and placed under the Governor General of India. April 1, 1867, the connection with India ceased, the province became a crown colony, and is administered by a governor residing at Singapore. In 1886 the Cocos or Keeling Islands were attached to the colony, and in 1889 Christmas Island. Christmas Island was annexed to the Settlement of Singapore in 1900 and the Cocos Islands in 1903. The British possessions, of 1,472½ sq. m., were inhabited (1901) by 572,249 persons, mostly Chinese and Malays. Since January 1, 1907, the colony of Labuan has been included in the colony and incorporated for administrative purposes in the Settlement of Singapore. The federated Malay states (Perak, Selangor, Negri Sembilan, and Pahang) comprise about 34,660 sq. m. Pop. (1891) 418,527, not including Johor, which has an estimated population of 300,000. The internal administration of these states is in the hands of the British residents. Mining is actively carried on, and tin is exported from Perak and Selangor. Fifteen hundred British troops and a few vessels maintain order and punish piracy.

Stramo'nium, a drug consisting of the seeds and leaves of *Datura stramonium*, an annual plant of the *Solanaceæ*, growing as a weed throughout almost all the temperate and warmer countries of the world. The herb, called thorn apple, and in the U. S. also Jamestown or Jimson weed, is found mostly in rank soil near dwellings. Its average height is 3 ft. The seeds are flat and of a dark-brown color. Both leaves and seeds contain an alkaloid, daturine, closely analogous in its poisonous properties to atropine. Medicinally, stramonium is a duplicate of belladonna. The dried leaves or powdered roots are smoked for the relief of asthma.

Strass'burg, fortified town of Alsace, on the Ill, the Breusch, and the Rhine-Rhône and Rhine-Marne canals; 2 m. W. of the Rhine. It is ill built, with narrow streets and high houses, but is improving. The most remarkable of its buildings is the cathedral, with a tower 466 ft. high, founded in 510 by Chlodwig, but the older structure was destroyed by lightning in 1007. In 1015 Bishop Werner, of

Hapsburg, laid a new foundation, and in 1275 the main building was finished. The tower was begun in 1277 and completed in 1439. In this building is the famous clock (made 1547–80), representing our planetary system and its constellations. The Church of St. Thomas, founded in 1031 and containing a monument to Marshal Saxe, and the New Church are also noticeable. A German university was opened May 1, 1872, and numerous educational and benevolent institutions exist. Commerce and industry flourish in consequence of the favorable situation on the river. Under French dominion the city had a strong bastioned circumvallation, but since 1871 a new system of fortification has been applied, consisting of large, strong forts surrounding the inner fortifications, so that an army can encamp between the city and the forts, while the city is protected from the enemy's fire by the outer forts.

During the Middle Ages Strassburg was one of the most powerful free cities of the German Empire, and during the Reformation it was a center of the Protestant movement. September 30, 1681, Louis XIV captured it, and by the Peace of Ryswick he retained it. It continued, however, a completely German city down to the revolution, when French gradually gained the ascendency. By the Peace of Frankfort (1871) it returned to Germany, and is the seat of the civil and military government of Alsace-Lorraine. Pop. (1905) 167,678.

Strassburg Clock, the famous clock in Strassburg made in 1547–80. It is 30 ft. high and 15 ft. broad at the base. It has globes and calendars which indicate sidereal time, the rising and setting of the stars, phases of the moon, the days of the month, the fixed and movable feasts. The days of the week are represented by figures of Diana, Mars, Mercury, Jupiter, Venus, Cupid, and Saturn drawn in chariots. A figure turns an hourglass at the end of each hour and the quarter hours are struck by figures—the first by an infant with a rattle, the second by a youth, the third by an old man, and the last by Death, with a bone. At the top is a figure of Christ, before which, each day at noon, passes a procession of figures of the twelve apostles while a cock crows three times.

Strat'egy, that branch of the art of war which has for its object the initiation and conduct of wars, campaigns, and battles in such a manner as (1) to take advantage of all available means for securing success, and (2) to cause the greatest benefits to result from victory and the least injury from defeat. Questions of statesmanship and diplomacy are frequently the leading factors in planning modern campaigns and battles, and thus become strategical considerations. The domain of strategy includes the methods of organizing and stationing active armies and reserves so that without unintentionally threatening or irritating neighboring countries they can be immediately mobilized. Financial and commercial considerations have weight in this connection, and frequently fix the time for beginning hostilities and determine the plan of campaign. In a country with a popular government, in order to arouse enthusiasm and lead the people to make necessary sacrifices, strategy, as defined above, sometimes requires a plan of campaign which, under other circumstances, might not be desirable.

An army in campaign seeks to obtain possession of some point which is known as its objective, which is selected with a view to the injury inflicted upon the enemy by its loss, and the advantages resulting from its capture. The first may be material, moral, or political; the second generally consist in facilities for further advance, better communications, and greater ease in supplying the army. Hence objectives are frequently capitals, large commercial or manufacturing cities, arsenals, river crossings, or railway centers. The base of operations is that part of a country from which an army draws its supplies. The portion of country between the army and its base which contains the railways, wagon roads, and water routes, by which the army advances and receives its supplies, is its line of operations or its communications. Since the combatants of an army cannot be expected to carry with them more ammunition, provisions, etc., than are needed for one battle, this line of operations must not be broken. Strategical movements frequently are directed with a view to threatening the enemy's communications and protecting one's own.

A large army covering a very extended front may, by a skillful attack, have one wing destroyed before the other can come to its support. To accomplish or prevent this is another problem in strategy of frequent application. Similar problems arise when a small but concentrated army tries to beat in detail the parts of a larger one which attempts to concentrate upon a point at or near that occupied by the smaller force, and also in maneuvering to strike a hostile force in flank. The guiding principles of strategy consist in so conducting the preliminary operations and movements as to force the enemy to fight at a disadvantage either in numbers, in position, or in the relative results which will follow victory or defeat. The best strategical combinations, however, will not secure victory unless supplemented by the proper handling of the troops in the battle, which is the climax of military operations, and which is the field of tactics.

There have been many great generals who were not men of learning, or even men with great powers of understanding. The question at once suggests itself, Why is it, then, that there are so few great generals? A glance at some of the difficulties met with at every step in actual campaigning will give the answer. A complete list of them would not be practicable, but the following are examples: (1) There are comparatively few men whose minds are not somewhat clouded by the presence of danger; great moral and physical courage are therefore necessary. (2) There is total or partial ignorance of the enemy's condition and intentions, and information is contradictory. The natural anxiety as to the correctness of our conjectures upon these points leads, with an ordinary man, to hesitation and doubt, and these are fatal. Perfect self-reliance and calm adherence to original plans are here demanded. (3) There is nearly always some miscalculation in the difficulties of a road or the strength of a post. Expecting to reach a point at a given time, a commander finds himself a long distance from it. Great energy, strong will, even some severity to obtain the utmost exertions of the troops, are here necessary. (4) The movements of an enterprising enemy call constantly for new combinations, and these must be made and acted on without hesitation. This demands great decision of character. (5) To insure the full support of troops, the general must be able to impress upon them his own spirit. This requires a deep knowledge of men. (6) There is always the element of chance; a sudden rain storm or a fog may neutralize the greatest efforts.

The following are some of the principal maxims of war: (1) Foresee everything that the enemy may do, and provide means to thwart him. (2) The forces employed must be proportionate to the obstacles to be overcome. (3) Debate well at the outset whether to assume the offensive or defensive; but the offensive having been selected, pursue it to the last extremity. (4) Be ready to meet the enemy at all hours of the day or night, whether on the march, at a halt, or in camp. (5) With an army inferior in numbers avoid a general battle, and supply the place of numbers by rapidity of marching. (6) The honor of his arms is a general's first consideration, the lives of his men secondary, though the two are entirely consistent with each other, for safety to the whole is found in audacity and persistency. (7) Never do what the enemy wishes you to, for the reason merely that he desires it. (8) When surprised by a superior enemy, a bold attack will generally disconcert him. (9) On the day of battle neglect no chance of success; a battalion sometimes decides the day. See TACTICS.

Strat'ford de Red'cliffe, STRATFORD CANNING (Viscount), 1786–1880; English diplomatist; b. London; educated at Eton and Cambridge; 1814, minister to Switzerland; 1820, on a special mission to the U. S.; 1824, to Russia, and, 1825, ambassador to Turkey. Diplomatic intercourse having been interrupted by the naval battle of Navarino, he returned to England and sat in Parliament until 1842, when he was again ambassador to Turkey till 1858, during which time his influence at the Ottoman court was great, and always in favor of reforms, especially to ameliorate the condition of the Christian population of Turkey. The most interesting point of his whole career was the contest between him and Prince Menshikoff, in 1853. The question was whether British or Russian influence should prevail in Constantinople, or, rather, whether Russia should be allowed to settle the destinies of Turkey to her own advantage and without regard to other European powers. The keenly contested diplomatic struggle—the result of which was the Crimean War—is narrated with dramatic power by Kinglake in his "Invasion of the Crimea." Canning was raised to the peerage in 1852 by the title of Viscount Stratford de Redcliffe. He published an essay, "Why am I a Christian?" and a drama, "Alfred the Great in Athelney."

Stratford, a city in Perth Co., Ontario, Canada, 88 m. W. of Toronto. It has excellent water power and manufactures of iron castings, agricultural implements, machinery, lumber, furniture, woollens, and flour. The Grand Trunk Railroad has extensive workshops in the city, giving employment to a large number of men. Pop. 16,000.

Stratford-on-A'von, in Warwickshire, England; 8 m. SW. of Warwick; on the Avon, here crossed by a bridge with fourteen arches built in the fifteenth century. The house in which Shakespeare was born is still preserved; that in which he died has been razed. The former, which is a Shakespeare museum, and Anne Hathaway's cottage (at Shottery, 1 m. W. of Stratford) are national property. In the chancel, restored 1890–92, Shakespeare was buried. Pop. (1901) 8,310.

Strath'clyde, an independent kingdom formed in SW. Scotland at the dissolution of the ancient Britannic confederacy, and consisting chiefly of the broad valley of Clyde. The annals of its sovereigns are involved in obscurity, little more than their names being known. It fell to the crown of Scotland early in the twelfth century, was held for some years by Prince David as an independent kingdom, and was permanently united to Scotland on his accession in 1124.

Strathco'na and Mount Roy'al, SIR DONALD ALEXANDER SMITH (Lord), 1820– ; Canadian statesman; b. Archieston, Scotland; entered the service of the Hudson Bay Company in 1838, and was promoted until he became resident governor and chief commissioner of the company in Canada. In 1870 he entered the legislature and the House of Commons, but resigned his seat in the legislature four years later. He remained in the house until 1880, and entered again in 1887, remaining until 1896, when he retired from Canadian political life on his appointment to represent the Dominion in London as High Commissioner. In 1897 he was raised to the peerage as Baron Strathcona and Mount Royal; Chancellor of Aberdeen Univ., 1903.

Stratifica'tion and Stra'tum. See GEOLOGY.

Stra'tus. See CLOUDS.

Strauss (strowss), name of a noted family of composers. JOHANN (1804–49), the elder, b. Vienna, in early childhood showed great talent for the violin; became deputy conductor to Lanner. In 1826 he had his own orchestra, and began writing the waltzes which have made the name of Strauss known everywhere. In 1840 he conducted for the first time in the Imperial Volksgarten, Vienna. He had five children. JOHANN (1825–99), the eldest son, b. Vienna, succeeded his father as conductor, and in 1863 became conductor of the court balls. He composed nearly 400 waltzes, and a number of operettas which have had great success. He retired from the conductorship in 1870 to devote himself to composition. JOSEPH (1827–70), the next son, b. Vienna, became also a conductor and composer. His works number upward of 283. EDUARD (1835–), the third son, b. Vienna, made his first appearance as a conductor in 1862; in 1865 conducted at St. Petersburg, and in 1870 succeeded his brother Johann in Vienna. He has composed over 200 dance pieces. Both Johann and Eduard visited the U. S. and conducted concerts.

Strauss, David Friedrich, 1808–74; German philosopher; b. Ludwigsburg, Würtemberg. While studying at Tübingen wrote his "Life of Jesus" (1835–36), based upon the principle that nothing which is supernatural, neither prophecy nor miracle, can be historical. He replied to his critics in several "Streitschriften" and in "Zwei friedliche Blätter." He lost his theological position at Tübingen, and became a teacher in Ludwigsburg and Stuttgart. He was called to be Prof. of Dogmatics and Church History in Zurich, 1839, but was deprived of his chair by a popular insurrection, though retaining for life half his salary; 1840–41, he attempted to do for theology what he had aimed at in his "Life of Christ," but his work, though learned and acute, made a comparatively slight impression. In 1847 he wrote an ingenious parallel between Julian the Apostate and King Frederick William IV of Prussia. In 1857 he produced an important "Life of Ulrich von Hutten." In 1864 he wrote a second "Life of Jesus."

Strauss founded no school, either in philosophy or theology. He was a critic, learned, sagacious, yet without well-defined ultimate system. His life is a reflex of the most extreme anti-Christian theory of human life. He began as an idealist, and ended as a materialist. He gave up his early Hegelian pantheism to the latest theory of atheistic evolution. Died at Ludwigsburg of cancer, after long and patient suffering, and was buried, by his own direction, without any church service.

Straw, the stalk or stem of certain grains, chiefly wheat, rye, oats, barley, and buckwheat, and sometimes of peas and beans. Straw enters largely into the manufacture of textile fabrics, paper, and braid for hats and trimmings. Mats for sleeping on are perhaps the earliest objects that were made from straw. Baskets and bags of braided straw are still common. Those made in the S. Sea Islands are so close in texture, though quite flexible, as to be impervious to water. A development of the art is shown in the Panama hats made in S. and Central America from the straw of the *Carludovica palmata.* The leaves of this plant, which resembles a palm, are gathered before they unfold, and, after the ribs and coarser veins have been removed, are cut into shreds. These are exposed to the sun and then tied into a knot and immersed in boiling water until they became white, when they are hung up in the shade and afterwards bleached. The finest Panama hats take several months to make, and come from Ecuador, while commoner kinds are made in a few days. In the U. S. a domestic straw from some varieties of hair grass was formerly used in making women's hats. Straw in its natural state is put to innumerable uses. The fiber from the straw of the flax plant is largely used in making linen. Straw is much employed in paper making, and rye straw yields the best qualities of paper.

Straw'berry, any species of the genus *Fragaria,* family *Rosaceæ.* The genus, comprising about twelve species, is confined to temperate climates. The species are all low herbs with thrice-divided leaves, propagating by runners, and bearing the flowers and fruits upon short scapes. The strawberry fruit is a fleshy receptacle or stem, upon which the true fruits or akenes—generally called seeds—are borne. The strawberry is of recent cultivation, the first-named garden variety having appeared in 1660. At the present time it is largely grown, and in N. America it exceeds in importance any other of the small fruits. Commercial strawberry culture began in the U. S. abt. 1830. The commercial strawberries of N. America are offsprings of the old Pine strawberries, sprung from the Chilian berry (*F. chiloensis*). In the N. U. S. strawberries grow best in a rich, sandy loam. The plants are not profitable after having borne three crops. An average good yield is from 150 to 250 bu. per acre.

Strea'tor, city of La Salle Co., Ill., on the Vermilion River. It is built on the river bluffs; is surrounded by a rich agricultural country, and is underlaid by several seams of coal, two of which are being worked, and also by valuable strata of shale, fire clay, and other clays, which are used in making paving brick, sewer pipe, and other clay products. The industrial establishments include clay-working factories, producing building and paving brick, sewer pipe, and tile; several manufactories of glass bottles, window glass, rolled plate glass, flint and Bohemian ware, and glass specialties; foundries and machine shops, and flour and planing mills. Pop. (1907) 15,771.

Street Rail'ways, or **Tram'ways,** railways constructed in cities or towns, and designed especially for local passenger traffic. The first street railway was built by John Stephenson in New York in 1831, on the Bowery and Fourth Avenue, from Prince Street to the Harlem River. In 1852 the Second, Third, Sixth, and Eighth Avenue lines in New York were begun. Boston began the construction of horse-car lines in 1856, Philadelphia in 1857, and New Orleans in 1861. In France a line was constructed in Paris in 1853. In Great Britain, in 1860, George Francis Train built a road at Birkenhead and one in London, which was removed in a few months, and not until 1870 were horse cars permitted in that city. In 1866 a number of horse-car lines were built in S. America.

In 1870, in several American cities, surface cable lines and elevated roads with steam locomotives began to be constructed. The first city to construct a cable line was San Francisco (1873), whose hilly location made horse cars impracticable on many of its streets. Chicago began to use cable traction in 1878, and Philadelphia in 1884. The first franchise for an elevated railway was granted to New

York City in 1867. The first plan was to use cable traction upon these elevated lines, but it was decided to adopt dummy locomotives, which were used for twenty years, until displaced by electricity. In Chicago the construction of elevated railways began in 1888; Boston's system was opened in 1903, and Philadelphia's in 1907.

In 1864 the dynamo was invented which later made possible the use of electricity to propel railway cars, but it was not until nearly twenty-five years later that it was adapted to street-railway service. At first the overhead trolley was used, but gave way to the underground trolley as soon as the difficulty of insulating the conductor in the conduit was overcome, and the expense reduced. The third-rail system utilizes a rail placed on the ties between the two-track rails or about 2 ft. outside of the rail as a positive conductor. A cast-iron sliding shoe collects the current from the rail. The third rail has many advantages for heavy work.

In 1890 seven tenths of the total single-track mileage of street railways in the U. S. was operated by animal power; to-day, with the exception of a few short cable lines, electric traction occupies the field. The transition from animal to mechanical traction was quickly made, because of the greater economy and efficiency of the electric railway. In 1888 there were 553 m. of horse-car lines in Massachusetts and no electric roads, and the ratio of operating expenses to gross receipts was 81.07 per cent. In 1902 there were no horse-car lines and 2,484 m. of electric roads, and the operating expenses had fallen to 69.5 per cent. For description of the system, see ELECTRIC RAILWAYS. In 1881 Mekarski applied compressed air with success as a motive power to street cars at Nantes, France, and the same method has since been applied in Paris and in Bern, Switzerland. See RAILWAY; UNDERGROUND RAILWAYS.

Strength of Mate'rials, the resistance of materials to forces which tend to change their form; often called the elasticity and resistance of materials. The materials used in constructions are more or less elastic when the applied forces are not too great—that is, they spring back to their original form upon the removal of these forces. It is a rule in engineering that materials should not be strained beyond the elastic limit, since then the elasticity is impaired and a permanent deformation results. The molecular resistance which is developed by an applied force is called stress. Stresses are tensile when the forces tend to pull a body apart, compressive when they tend to crush it, and shearing when they tend to cut it across. In bending a beam stresses are produced often called flexural, but they can always be resolved into those of tension, compression, and shear; in twisting a shaft, stresses are produced often called torsional, but they can also be resolved into the three kinds of simple stress.

Of materials, steel has the greatest strength, followed by wrought and cast iron. Timber varies in strength, the heavy woods, as box, ash, and beech, being more resistant than the lighter poplar and white pine.

Steady stresses occur in buildings, varying stresses in bridges, while shocks are liable to occur in machinery and on railway wheels and rails. The injurious nature of shocks requires a high factor of safety, and hence a low working stress. A load suddenly applied theoretically produces twice the stress caused by the same load when applied gradually, and the elongation is also double. When a load drops upon a bar the resulting stresses and deformations are often more than double those caused by a gradually applied load. In all cases it is desirable that such a factor of safety should be used that the maximum working unit stress may not exceed one half the elastic limits of the material. Repeated stresses beyond the elastic limit cause a change of molecular structure, or, as commonly expressed, the material becomes fatigued. For instance, if the ultimate strength of a bar of wrought iron is 55,000 and its elastic limit is 25,000 lb. per sq. in., a single application of a load will not cause fracture until the 55,000 lb. per sq. in. is reached; but if stresses be often applied which exceed the 25,000 lb. per sq. in., the molecular structure is altered, the iron becomes brittle, and finally fracture will occur under a stress of perhaps 30,000 or 40,000 lb. per sq. in. It is, hence, a fundamental rule that the materials of permanent structures should not be strained beyond the elastic limit, and the factor of safety should be selected with this in view.

Strike (in geology). See FAULT.

Strike, the refusal of the employees of an establishment to work unless the management complies with some demand. A lockout occurs when the management refuses to allow employees to work except under some condition dictated by the management.

The first great strike of which we have a record was that of the Hebrews in Egypt. There was a prolonged labor agitation, lasting many years, which the Egyptians endeavored to repress by imposing severer tasks upon the Hebrews.

A strike may be declared for one or more of the following objects: (1) To secure an advance or resist a reduction in wages. (2) To effect a reduction or oppose an increase of the hours of labor. (3) To resist the discharge of union men and hinder the employment of nonunion men. (4) To regulate methods of work, materials used, number of apprentices, kind of work done by each branch of laborers, and the like. (5) To support a strike in some other industry or in some other branch of the same industry, as when pavers strike to help granite cutters, or brakemen to help switchmen on a railway. These are sympathetic strikes. Strikes are wisely held by workmen to be the last resort of a contest, and never to be risked until it is clear that the desired object cannot be reached without them. They are expensive, arduous, and uncertain, and if rashly undertaken end in disaster after much suffering.

To the earlier weapons of strikers modern ingenuity has added the boycott, by which all markets are closed against the goods of the employer against whom a strike is ordered. This proved a very effective weapon in the hands of laborers, but its illegality has recently been declared by the courts.

The first recorded strike in the U. S. was that of the journeymen bakers in 1741. The leaders were tried for conspiracy. Next came the shoemakers of Philadelphia in 1796, 1798, and 1799; then the sailors in Philadelphia in 1803, who struck for $14 against $10 a month. They were arrested and the leaders imprisoned. In 1809 the New York cordwainers struck, and used the term "scab" to denote nonstrikers of their association. Printers struck in 1821, using the word "rat" for nonunion men against whom they struck. In 1834 the first women's strike took place at Lynn, Mass., in the shoe trade. It was unsuccessful. In 1877 occurred the great railway strikes on the Baltimore & Ohio, the Pennsylvania, and the Erie systems, resulting in the destruction on July 21st–23d of 1,600 cars, 126 locomotives, and $5,000,000 worth of property. In the spring of 1892 occurred the granite cutters' strike, which extended finally to pavers in New York, and arrested for a time the whole stone industry. This was, however, quite eclipsed by the famous strike in the Carnegie ironworks at Homestead, which were kept in a state of siege for several days. Eight thousand soldiers were required to subdue the rioters, and though the strike apparently failed, yet it probably minimized the willingness of both laborers and capitalists to enter upon future battles. In 1894 a railway strike in Chicago and other Western cities, although a failure, threatened for a time the commercial interests of the whole country.

The cost of strikes runs into enormous sums; $60,000,000 was sunk in strikes and lockouts from 1881 to 1886. One lockout on the Clyde, in Scotland, was reckoned to have cost the unions $750,000, while $1,560,000 was lost in wages. A strike in Manchester, England, cost the unions $400,000 and the employers $1,500,000. False economic theories are responsible for a large part of the enmity between capital and labor, out of which strikes and lockouts are born. The false notion that profits must fall as wages rise—a notion contradicted flatly by history, which shows high wages and large profits inseparably yoked together—is partly responsible for the striking spirit. The higher-priced workmen are in reality the cheaper, on account of the quantity and quality of the work done. Low-priced labor is found to be dearest. Of course, it would be but a visionary business policy to favor increasing wages were it not that wage advance means larger demand, increased consumption, and ultimately larger profits, out of which, again, further advances of wages may be made, as they will certainly be demanded by strikes. Violence nearly always condemns the strikers in public regard and defeats their ends, while it cripples their resources. It is of no advantage to workmen striking for wages to destroy the property out of which wages come, and the impolicy of violence toward property is now becoming clear to strikers themselves; but toward workmen seeking to take the place of strikers there is still a ready spirit of violence.

During the period 1881–1905 there were in the U. S. 36,757 strikes and 1,546 lockouts, involving 199,954 establishments and throwing 9,529,434 persons out of work. The greatest number of strikes occurred in the building trades and the largest percentage of strikes was in New York State.

Strob'oscope, an instrument for examining the motion of a body by intermittent light. In its simplest form it is a disk perforated with a series of equidistant radial openings, through which the body is viewed while the disk rotates uniformly. The principle of the stroboscope is applied in instruments to which a variety of names have been given, such as thaumatrope, phenakistoscope, vibroscope, zoetrope, zoöpraxiscope, kinetoscope, etc. If a succession of photographs of a rapidly moving body be taken at intervals of less than one tenth of a second, and these be appropriately arranged for examination by the stroboscopic method, the resulting perception is that of the body in actual motion. With the development of instantaneous photography the preparation of such series of pictures has been brought to a high degree of perfection.

Strom'boli, northernmost of the Lipari Islands, in the Mediterranean, off the N. coast of Sicily; area, 8 sq. m. It is wholly of volcanic formation, and has a constantly active volcano, 3,040 ft., with an extinct crater on top, but an active one on the side at about 2,150 ft. Cotton, wine, and fruit of superior quality are produced, and sulphur and pumice stone are exported. On the east side lies the small town of Stromboli. Pop. of island, 2,000.

Stron'tium, the metallic basis of strontia, one of the alkaline earths, first obtained by Sir H. Davy in 1808. It is a pale yellow, burns with a crimson flame, emitting sparks; decomposes water, liberating hydrogen gas; is hard, ductile, and malleable, and is obtained from the anhydrous chloride by electrolysis. Specific gravity, 2.54; atomic weight, 87.5; symbol, Sr. Its most important compound is the oxide called strontia, a grayish-white, porous mass, which combines with water to form a white powder, hydrate of strontium ($SrO.H_2O$). This compound has acquired importance in Germany for its use in extracting sugar from beet-root molasses. The nitrate $Sr(NO_3)_2$ is employed in making crimson lights in fireworks. The crystalline sulphate ($SrSO_4$) is found native, and is known as celestine.

Strophan'thus, a genus of apocynaceous plants. From certain African climbing shrubs of this genus is prepared a poison locally known as kombo, inee, and onaye, and used for the purposes of the chase and war, which contains a crystalline principle, strophanthin, which has a powerful influence upon the muscular system, first stimulating, but if in sufficient doses finally causing a general paralysis, ending in death through failure of the respiration. It affects not only the voluntary muscles, but also the muscle fibers in the heart and in the walls of the blood vessels; and since its first action, and indeed its entire action when in minute doses, is stimulating, it is a valuable remedy in failure of the heart. It resembles digitalis, but is more prompt and fugacious in its action, and acts more powerfully upon the kidneys.

Stru'thin. See SAPONIN.

Strutt, John William (third Baron Rayleigh), 1842– ; English physicist; educated at Cambridge; fellow of Trinity College, 1866; Prof. of Experimental Physics, Cambridge, 1879–84; Prof. of Natural Philosophy, Royal Institution of London, since 1887. He is the author of "The Theory of Sound." In 1894, in conjunction with Prof. Ramsay, he discovered a new element in the atmosphere, which he has called argon.

Struve, Otto William, 1819– ; b. Dorpat. As consulting astronomer he superintended, 1847 to 1862, all investigations conducted by the Russian army and navy. He succeeded his father as director of the observatory of Pulkova and resigned 1890. His labors relate chiefly to nebulæ, double stars, faint satellites, and comets, and include a new determination of the constant precession, the discovery of about 500 new double stars, the determination of the mass of Neptune, investigations in regard to Saturn and his rings and to the parallax of various fixed stars, and observations of the nebula of Orion. He first showed that the red prominences visible in a total solar eclipse belong to the sun's surface.

Strych'nine. See NUX VOMICA.

Stu'art, or **Stewart,** a royal family which has given several sovereigns to Scotland and England. They trace their descent to a Norman baron, Alan, who accompanied William the Conqueror, and received large gifts of land in England. His second son went to Scotland, entered the service of David I (abt. 1130), by whom he was made steward of the kingdom, the dignity remaining hereditary in the family, who assumed the title as their family name. The sixth of these Stewards married in 1315 a daughter of Robert Bruce, and their son Robert in 1371 succeeded David Bruce on the throne of Scotland as Robert II. The following are the sovereigns of the Stuart line, with the dates of their accession: ROBERT II (1371), ROBERT III (1390), JAMES I (1424), JAMES II (1437), JAMES III (1460), JAMES IV (1488), JAMES V (1513), MARY STUART, Queen of Scots (1542); JAMES VI, crowned King of Scotland in 1568, King of England as JAMES I (1603), and transmitted both thrones to his successors; CHARLES I (1625), CHARLES II (1649), and JAMES II (1685). See the respective titles. James II's son, JAMES EDWARD FRANCIS STUART, assumed the title of James III upon the death of his father, and is known as the Old Pretender. His eldest son, CHARLES EDWARD, is known as the Young Pretender. Henry, the second son of the Old Pretender (see STUART, HENRY BENEDICT MARIA CLEMENT), died in 1807, and with him ceased the line of the Stuarts. The present royal family of England are descended only indirectly, and in the female line, from the Stuarts, through a granddaughter of James I of England, upon whom the succession was bestowed by Parliament.

Stuart, Arabella or Arbella, 1575–1615; often called the Lady Arabella; the only child of Charles Stuart, Earl of Lennox, brother of Darnley and uncle of James I. Her relationship to Elizabeth, being the same as that of James, made her the subject of constant intrigues, and in 1603 Sir Walter Raleigh was accused of a plot to raise her to the throne. In 1610 she secretly married William Seymour, grandson of the Earl of Hertford. Seymour was committed to the Tower, and the Lady Arabella placed in custody. In June, 1611, she escaped by feigning illness, but was captured while sailing to France and thrown into the Tower, where she became insane.

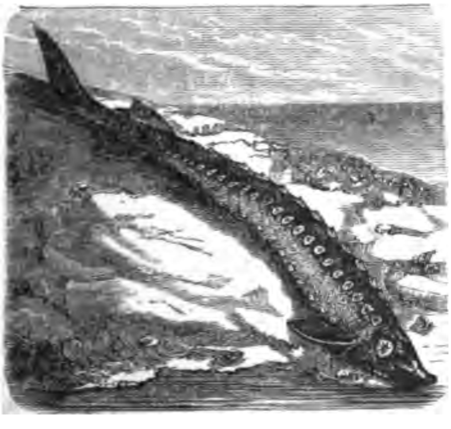
Stuart, Gilbert Charles, 1755–1828; American painter; b. Rhode Island. He received his first instructions from a Scottish painter named Alexander, went to England in 1778, was befriended by West, and rose to eminence, rivaling Reynolds. After residing in Dublin and Paris, he returned to America, 1793. He went to Philadelphia to paint a portrait of Washington, and destroyed his first picture as unsatisfactory; but at the second sitting he produced the well-known head from which he painted all his other portraits of Washington, and which is regarded as the standard likeness. After residing several years in Washington, he settled in Boston, 1806. As a painter of heads he holds the first place among American artists, if we except Copley, and his flesh coloring rivals the finest modern efforts. Over 750 of his portraits are in existence.

Stuart, James Ewell Brown, 1833–64; Confederate cavalry general; b. Patrick Co., Va.; graduated U. S. Military Academy, 1854. Resigned his captaincy in the Union army, and was in chief command of the Confederate cavalry at the first battle of Bull Run. As brigadier general (September, 1861) and major general (July, 1862) he served with the army of N. Virginia. During the invasion of Maryland he covered the Confederate rear, and took part in the battle of Antietam. At Chancellorsville, after the fall of Stonewall Jackson, he was in temporary command. During the campaign of Gettysburg he passed up through E. Maryland and Pennsylvania, and rejoined Lee at Gettysburg. In 1864 Stuart, by a wide detour, succeeded in interposing himself between the Confederate capital and Sheridan's column. Concentrating at Yellow Tavern, near Richmond, he was attacked by his able rival. During the obstinate but ineffectual struggle Gen. Stuart was mortally wounded.

Stubbs, William, 1825–1901; English historian; Bishop of Oxford; b. Knaresborough, educated at Ripon, Christ Church, Oxford; elected a fellow in Trinity College; took holy orders, 1848; became vicar of Nayestock, 1852; librarian to the Archbishop of Canterbury, 1862, and was school inspector in the diocese of Rochester, 1860–66, when he received the appointment of Regius Prof. of Modern History at Oxford. In 1869 he became curator of the Bodleian Library; was chosen as a member of the hebdomadal council in 1872, and in 1875 received the presentation of the rectory of Cholderton, Wiltshire. He was appointed canon residentiary of St. Paul's in 1879, consecrated Bishop of Chester in 1884, and became Bishop of Oxford in 1889. Published many books on historical and ecclesiastical subjects. His "Constitutional History of England" is one of the ablest and most authoritative works on the period of which it treats.

Stuc'co, plastic, adhesive composition applied to walls to give them a smooth and even surface, either decorative or plain. The cementing medium of the composition for inside work is common lime or calcined gypsum, or a combination of the two, generally mixed with sand. The word *stucco* technically applies to a mixture of lime putty and white sand or powdered marble, and to a coating produced with this compound. The rudest example of the plasterer's art is the application of a single coat of mortar composed of lime paste and common sand laid on the surface of a wall with the trowel, while the highest consists in imitating fine marbles and other beautiful building stones by using pure calcined gypsum, mixed with gum, isinglass, and suitable coloring matter, laid on in a variety of decorative forms in order to produce panels, pilasters, moldings, cornices, etc.

The mortars used for inside plastering are "coarse stuff," "fine stuff," "gauge stuff," called also "hard finish," and "bastard stucco." Coarse stuff is simply common lime mortar, of the quality suitable for brick masonry, mixed with well-switched bullock's hair free from animal and vegetable matter. Fine stuff is prepared by slaking pure lump lime with a small quantity of water, and afterwards adding water until the paste is diluted to the consistency of cream. It is then allowed to stiffen by evaporation. One coat of plastering on laths is said to be *laid*, and the coat is called a *laying* coat; and work in two coats is said to be *laid* and *set*, and the coats are styled a *laying* coat and a *set* coat. In three-coat work on laths the first is called the *pricked-up* or the *scratch* coat, the second is the *floated* coat, and the third the *set* coat. In the U. S. hydraulic cement and clean, sharp sand, mixed up with fresh water to the consistency of plasterer's mortar, is most commonly used for the exterior coating of walls, more especially of brick walls. The mortar is usually applied in two coats in one operation; that is, the second coat is put on while the first is yet soft and plastic, so that the two become one.



COMMON EUROPEAN STURGEON.

Sturgeon (stûr'jŭn), any ganoid fishes of the *Acipenseridæ*. All the species have the body elongated, or slightly compressed and tapering backward. Species are found in all the temperate portions of the N. hemisphere. All breed in the fresh water, but some are residents of the sea part of the year, while others are permanent denizens of the lakes and rivers. They nearly agree, in fact, in distribution with the salmonids, save that they are less generally found in streams, on account of their larger size. Their flesh is reddish, and is highly esteemed. Their eggs are often made into caviare; their air bladders can yield a kind of isinglass. They are the largest of fresh-water fishes, the huso (*A. huso*) of the Caspian and Black seas sometimes exceeding the length of 15 ft., and the weight of 2,000 lb.

Sturm (stôrm), **Johannes von,** 1507–89; German educator; b. Schleiden; founded (1537) the gymnasium in Strassburg, which attained, under him, world-wide celebrity. He was the greatest educator connected with the Reformed Church, and received the title *Præceptor Germaniæ*. His work gave a great impulse to the establishment of classical schools, and introduced the method of grading pupils. To read, write, and speak Ciceronian Latin was the great object of his instruction, and to this end a course of twenty-one years—six at home, ten at school, five at college or university—was thought about sufficient.

Stut'tering. See STAMMERING.

Stutt'gart, capital of kingdom of Würtemberg, Germany; on the Nesenbach, an affluent of the Neckar; 38 m. ESE. of Carlsruhe. It lies in a charming valley. The Alstadt, occupying nearly the center, and grouped around the marketplace, contains several small and narrow streets, but the new parts of the city, mostly erected during the nineteenth century, have broad and beautiful streets and symmetrical squares. The most prominent point is the palace square, surrounded by magnificent buildings. Among these the new palace is the most remarkable—a very handsome structure, with two projecting wings, the central building containing 365 rooms rich in works of art. To the right of this edifice stands the old palace, built 1553–70, a gloomy castle with towers and pinnacles. The finest promenade is the palace garden, a park with lakes, fountains, statues, etc., stretching from the palace for 2 m. In the vicinity are the royal summer palaces, Solitude, Villa Rosenstein, Wilhelma, and the Villa, and the charming town of Canstatt-on-the-Neckar, with 22,000 inhabitants, frequented as a bathing place. The woolen industry is important. The manufactures of pianos, carriages, chocolate, sugar, and machinery are considerable. The commerce of the city is extensive; the book and art trade is especially important. Pop. (1905) 249,286. The name *Stuttgart* first occurs in history in 1229, though the exact date of its foundation is not known. It became the residence of the Count of Würtemberg in 1320, and the capital, 1482. The city was held by Austria, 1519–34, and occupied by Alba in 1546. From 1634–38 one half (8,810) of the inhabitants died from the plague. In the wars of Louis XIV it was taken by the enemy three times; also several times during the wars of Napoleon.

Stuyvesant (stī'vě-sănt), **Petrus,** 1602-82; the last Dutch Director General of New Netherland (New York), b. in Holland. Lost a leg in an attack upon the Spanish island of St. Martin. He arrived at New Amsterdam as director general in May, 1647; conciliated the Indians, who had been provoked to hostilities by his predecessor, William Kieft, and restored order in every department. In 1655 he ousted the Swedes from their possessions on the Delaware, where they had taken Fort Casimir, built by the Dutch in 1651. In August, 1664, an English fleet under Richard Nicolls appeared in the bay and demanded the surrender of the city, in virtue of the grant by Charles II to the Duke of York of the territory between the Connecticut and the Delaware. The municipality, seeing the futility of resistance, insisted on yielding, and the city was given up on September 3d. Stuyvesant went in 1665 to report to his superiors in Holland, but returned and spent the remainder of his life on his *bouwerij* or farm, whence the Bowery derives its name.

Sty, or **Horde'olum,** a small boil on the edge of the eyelid. It should be treated with a warm-water dressing or light wet poultice; after the discharge of a little pus and a slough, it usually gets well at once. If there be a succession of sties, tonics, with mild laxatives, will be useful.

Style, or **Sty'lus,** an instrument, usually made of metal, bone, or ivory, used in olden times for writing. It was sharp at one end for writing, and flattened at the other for the purpose of making erasures on the tablets, which were covered with wax.

Style, Old and New. See CALENDAR.

Sty'lites. See PILLAR SAINTS.

Stylit'es, St. Sim'eon. See SIMEON STYLITES.

Styr'ia, province of Austria; bounded N. by upper and lower Austria, E. by Hungary, S. by Carniola and Croatia, and W. by Carinthia and Salzburg; area, 8,670 sq. m.; pop. (1900) 1,356,494, of whom over 710,000 are of German and the rest of Slovenian descent; capital, Gratz.

Styx, in Greek mythology, a river of Hades which flowed from the tenth source of Oceanus. At the entrance to Hades was the abode of the nymph or goddess Styx, by whom the most solemn oaths of the gods were sworn, thus dedicating themselves to death in case of perjury. Styx was also the name of the highest waterfall in Greece, near Nonacris in Arcadia. The ancients, like the modern residents of the vicinity, considered its waters poisonous, and it was believed that no vessel could hold any of it unless made of the hoof of an ass or horse.

Sua'bia. See SWABIA.

Suakim (swä'kĭm), or **Sawakin** (sä-wä'kĭn), fortified town of Nubia and best port on the Red Sea; on an island near shore. It has been in the possession of the British since 1882. Formerly the head of the caravan routes into the interior, it lost much of its importance as a result of the Mahdist rebellion, and this is not yet recovered, because of the insecurity of the interior. Opposite Suakim on the mainland is the suburb of El-Kef. Suakim is of great strategical and commercial importance, and is the most suitable terminus for a railway into Egyptian Sudan. The chief exports are gum arabic, silver, ivory, senna, and skins. Pop. (1897) 15,713.

Sublima'tion, a chemical process of separation and purification, applicable only occasionally in cases in which a volatile substance condenses or crystallizes from the condition of vapor directly to the solid condition, and not to the usual liquid form. Among the more important substances to which this method is applicable are sulphur, iodine, vermilion, corrosive sublimate, calomel, salts of ammonia, arsenious oxide, oxalic, benzoic, succinic, and pyrogallic acids, camphor, caffeine, etc.

Sublime' Porte. See PORTE.

Submarine' Mines. See TORPEDOES.

Submarine Naviga'tion, the art of navigating a submerged vessel. In submarine navigation it is requisite that an operator should be able to move freely in any direction and at any depth, and with no communication with the surface except at long intervals. The accounts of early attempts to accomplish these results are exceedingly meager, and but little was done till 1771, when David Bushnell suggested the idea of attacking a vessel underneath the water, and constructed a submarine boat capable of accomplishing the desired object. The accompanying figure corresponds with the descriptions and will serve to illustrate an invention which was the most perfect thing of its kind that has ever been invented.

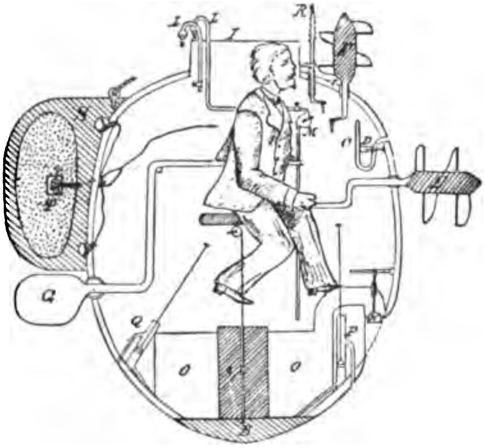


FIG. 1.—BUSHNELL'S SUBMARINE BOAT: VERTICAL LONGITUDINAL SECTION. *A*, Permanent ballast; *B*, movable ballast; *C*, water-gauge; *D*, compass; *E*, screw; *F*, screw; *G*, rudder; *I*, entrance; *LL*, air-pipes; *M*, ventilator; *XX*, valves in *LL*; *N*, valve to admit water; *OO*, water tank; *P*, pump for discharging *O*; *Q*, bilge pump; *R*, wood screw; *S*, magazine; *T*, percussion clockwork.

The boat was shaped like a turtle, and floated in the water with the tail down. It contained air enough to support life for half an hour, and air could be renewed through small ventilators by rising to the surface. The operator was seated in the middle, the seat forming a brace between the two sides, and in this position he had his eyes opposite one of the numerous glass plates in the cover or top of the boat. In front of him was the handle of a screw, by which the boat was propelled; another, by which it was raised or lowered; a compass marked with phosphorus; a water gauge, to show the depth, marked with oil and phosphorus; and near him the handles or treadles of various small pumps and levers, by which water and foul air were expelled, the rudder moved, ballast let go, etc. The torpedo consisted of a block of oak containing a charge of about 150 lb. of powder. This block was on the upper after part of the boat, and connected by means of a rope to a wood screw, the handle of which was directly in front of the operator.

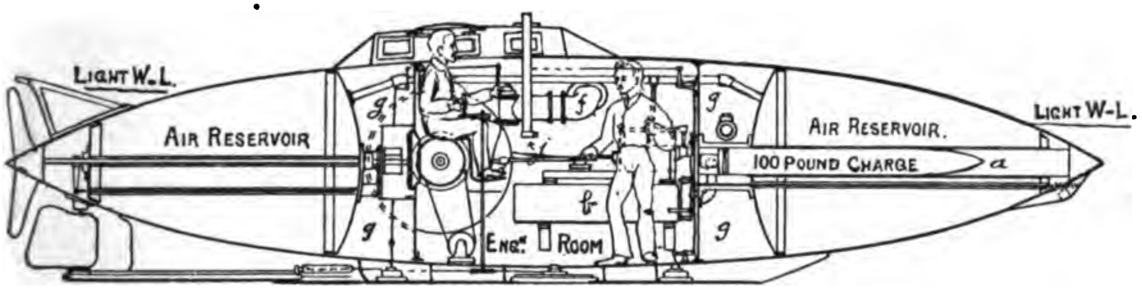


FIG. 2.—VERTICAL LONGITUDINAL SECTION OF HOLLAND'S SUBMARINE BOAT. *a*, submarine gun and projectile; *b*, firing-charge chamber; *f*, automatic air-pressure regulator; *g*, *g*, water ballast tanks; *j*, camera lucida.

The mode of operation was to move slowly along the surface, with the top just awash, till within a short distance of a vessel at anchor, then to sink, and, coming up underneath the bottom, fasten the torpedo by means of the screw. The torpedo and screw were then detached from the operator's boat, a clockwork mechanism inside the torpedo being set for six, eight, or twelve hours' run, thus allowing the operator time to escape.

Since Bushnell's time many inventors, including Fulton, have given attention to submarine navigation, but it is only within the last half century that any real progress has been made. In France, under the auspices of the government, experiments were made by Bourgeois and Brun, followed more recently by those of Groubet and Zédé, while in England the Nordenfeldt boat gained approval. In the U. S. the inventions of George C. Baker, of Detroit, and J. P. Holland (see Fig. 2), of New York, have been conspicuous. The types vary, and improvements are constantly being made. These conditions, together with the secrecy of the experimenters, prevent the giving of descriptions of the latest forms.

Essentially the general requirements for submarine boats for war purposes—and this is their only practical use—given in the order of their importance, are safety, facility of maneuver, speed, endurance, and offensive power. For safety the boat must have strength to resist the crushing force of the greatest depth to which it will descend, and must possess a reserve buoyancy, overcome during submergence by mechanical means, but never destroyed. It must have stability enough to prevent capsizing or considerable change of trim under service conditions, and must carry an ample supply of air for the crew. Modern steel construction provides the necessary strength for a submergence of 150 ft., which is ample, to be obtained with a weight of hull of about one half the displacement. Reserve buoyancy is a feature of all modern submarine boats, and additional safety is given by various devices, whereby the pressure due to any stated depth will automatically impel the boat upward, either by expelling water from the tanks or by moving the horizontal rudders.

Stability on the surface is obtained as in ordinary vessels, and below the surface by simply placing the center of gravity below the center of buoyancy. Compressed air in tanks gives a ready means of ventilation, but in a boat of ordinary size there is enough air to last the crew several hours, especially as the storage batteries generally in use for propulsion under water give off a certain quantity of oxygen. Complicated means for purifying the air are found to be practically not necessary. Facility of maneuver in the vertical plane can probably be best obtained by diving rudders, for with these a boat can most quickly come to the surface and again disappear. Any simple form of pressure gauge will indicate the depth of submergence, and the variations of the water pressure are easily made to control the diving rudders automatically, the replacement of fuel, torpedoes, or other stores expended by an equal weight of water keeping the buoyancy and trim unchanged. Motion in the horizontal plane is controlled by ordinary rudders, and twin screws add to the turning power. Surface speed is of great importance, since approach to an enemy must be on the surface, and escape may depend upon it. Steam propulsion is still the best for surface use, means being provided for rapidly housing the smokestack and sealing the furnace doors preparatory to diving.

Endurance depends only on the weight which can be allotted to fuel or other sources of power. Fuel for a run of 1,000 m. on the surface and electric power for a run of 50 m. under water can easily be carried in a boat of

150 tons. For purposes of offense the automobile torpedo is probably most effective, though the submarine gun, using either powder or compressed air as a propelling charge, promises well. Speed under water is best obtained by the use of the electric motor and storage batteries, the feature of unchanging weights having manifest advantages. With a vessel of good form there should be no difficulty in attaining as great or greater speed than on the surface, but there is no probability that high speeds will ever be used in submarine navigation, the impossibility of seeing anything and the uncertainty of position and direction rendering it necessary to move slowly.

Subpœ'na, in law, a writ or process by which either parties or witnesses are compelled to appear in court or before a judicial officer and answer or testify, as the case may be, under a penalty for their disobedience. There are several different kinds of this writ. The common species of subpœna now used in all the courts is for the purpose of ordering witnesses to attend upon a trial or other judicial examination and to give their evidence thereat. It generally purports to be issued by the court, to be signed by its clerk, and sealed with its seal; but in the loose practice prevailing in many states of the U. S. it is issued by the attorney. A variety termed the *subpœna duces tecum* contains an additional clause directing the witness to bring with him into court certain books, papers, etc., in his possession which may be useful as evidence, and which must be designated with sufficient particularity to apprise the witness of the exact papers to be produced. Both these forms are compulsory; the witness must obey the mandate, and it is for the court alone to decide whether his evidence or the documents he is ordered to produce are material and proper. If the witness violates the command, an action for damages may be maintained against him by the party who is materially injured by his default. The subpœna is served by exhibiting the original to the witness and delivering to him a copy thereof, and paying him his lawful fees for travel and for attendance.

Subroga'tion, an equitable doctrine by which a person paying in proper circumstances a debt which as between himself and another should have been paid by the latter is given the rights and remedies of the original creditor.

Sub'sidy, money given in aid of something; specifically, in modern use, a grant of money by the state in aid of individual enterprise. This is the most common use of the word since 1840. In English constitutional history a subsidy is a special tax on persons (not on property), and in general European political history it is a payment of money to an ally to aid in carrying on a war.

In the modern sense of the word, subsidies have been granted especially to railway and steamship lines. In several continental European countries, the government defrayed about one half the original cost of the railways. In the U. S., states and municipalities have subscribed largely, sometimes unwisely, to railway stocks and bonds. The Federal Government has usually given land grants, but in 1862 Congress granted in addition a money subsidy of over $25,000 a mile to the Pacific railroads. Great Britain has paid no railway subsidies, but as early as 1840 granted an annual subsidy of £81,000 to the Cunard Steamship Line, which amount was gradually extended until 1858. Grants were also made to other lines until about a million pounds annually were so paid. This has been considerably reduced in recent years, owing largely to public sentiment consequent on the success of unsubsidized lines. Similar, though smaller, subsidies were given in the U. S. to the Collins and other lines, and these amounted to several million dollars just after the Civil War; but a reaction in public feeling abolished most of them, and the most strenuous efforts have been unsuccessful in renewing them on any considerable scale, though by 1894 over $700,000 were paid to various lines. Subsidies are usually paid ostensibly for transporting the mails, but are generally advocated as means of building up a merchant marine and of supporting lines of vessels that may furnish cruisers in war time.

Substitu'tions, The'ory of, branch of modern mathematics. A substitution is an operation which is conceived to interchange quantities or symbols among themselves, putting one in place of another, but taking none away and adding no new ones. If we have an algebraic expression containing several symbols, say the roots of an algebraic equation, some substitutions may change the value of the expression and others may not. For example, in the expression $x + y - z$, an interchange of x and y makes no change of value, because $x + y = y + x$; but interchanging either of these quantities with z changes the value.

Sub'way. See UNDERGROUND RAILWAYS.

Succes'sion, the distribution of intestate estates which now prevails dates back directly to a statute enacted in 1670 (22 and 23 Car. II, cap. 10) by which the respective rights of wife, children, and next of kin were fairly and, as the event has proved, permanently adjusted. One third of the personal estate undisposed of by will, and remaining after the payment of debts and funeral expenses, was to go to the widow and the residue to the children, to be equally divided. If there was no widow, the children took the whole of the surplus; if there was a widow but no children, the widow took one half and the next of kin (parents, brothers and sisters, grandparents, etc., "everyone according to the degree that belongs to him") took the other half. If the intestate left no widow or children, the next of kin were entitled to the whole surplus. In case a person entitled was dead, his legal representatives would take his share. There was no discrimination (as there was in the rules regulating the descent of real property) against kin of the half blood nor against female kin, but all of the same class or grade of kinship inherited equally. The rights of the husband in the personal estate of his wife were not altered by this statute, but remained as at common law. As a married woman could own no personal property during her life, she could, of course, leave none at her death, save only such claims against others (*choses in action*) as her husband had not previously reduced to possession. As to these, he was solely entitled to administration for the purpose of collecting them in and converting them to his own use.

The statutes of distribution now in force in Great Britain and the U. S. are substantially only reënactments of the act of Charles II above described. The meaning of the expression "next of kin" and the relative rank of such persons, and the order of their succession, are defined with precision in the several statutes of distribution. The test usually applied is nearness in degree of blood, and the method employed to ascertain the degree is usually that of the civil law. Persons born out of lawful wedlock have no part in the distribution of personal estate, whether they claim as children of the intestate or as next of kin. A bastard is *nullius filius* by the common law, and is wholly outside the pale of consanguinity. In some of the states, however, an illegitimate child has by statute been rendered capable of inheriting from his mother. Of course, if such a person marries, he or she thereby becomes capable of taking property by descent from the wife or husband, the capacity in that case being wholly independent of any relationship of blood.

Succession Wars, wars resulting from conflicting claims to the throne, especially applied to the four wars of the eighteenth century that arose from the disputed succession to (1) the throne of Spain (1701–14), (2) that of Poland (1733–38), (3) that of Austria (1741–48), and (4) that of Bavaria (1778–79)—of which only the first and third are of sufficient importance to be treated here.

War of the Spanish Succession.—The imbecile King of Spain, Charles II (1665–1700), had no children, and the succession accordingly devolved upon the collateral heirs. In the lifetime of Charles there were three principal claimants: first, Louis XIV, in right of his wife, Maria Theresa, daughter of Philip IV, who, however, had renounced her right in the Treaty of the Pyrenees; second, Leopold I, Emperor of Germany, by virtue of his descent from Philip III of Spain; and third, Joseph Ferdinand, the electoral Prince of Bavaria, grandson of Leopold and Margaret Theresa, the younger daughter of Philip IV. Neither Louis nor Leopold ventured to claim the throne for himself, the former supporting the candidacy of his grandson, Philip, Duke of Anjou, the latter that of his second son, the Archduke Charles. Nevertheless, so great an accession of power to either the Bourbon or the Hapsburg dynasty was thought to endanger other nations, and it was agreed that the electoral prince should succeed to the Spanish throne. His death, however, in 1699, reopened the question.

In the intrigues which ensued Louis was successful, and Charles II made a will bequeathing his possessions to Philip of Anjou. The latter was well received in Spain, and his title was generally recognized throughout Europe, but Louis alienated other nations by declaring that Philip's succession to the Spanish throne had in nowise affected his right to the throne of France, and he angered England by pronouncing the Pretender the lawful heir to the English throne; 1701–2, the Grand Alliance was concluded between England, the emperor, the Dutch, the King of Prussia, and the Grand Duke of Hesse, with the object of breaking the power of the Franco-Spanish monarchy. For ten years the war was carried on, the chief campaigns being in Spain, in Italy, in the Rhine countries, and in the Spanish Netherlands. In Spain the French were successful, and, under Berwick and Vendôme, expelled the invaders and maintained Philip. In N. Italy the Austrians, under Prince Eugene, conquered Milan and Mantua, and, after a victory at Turin, forced the French to withdraw from Italy. In the meanwhile Marlborough and Prince Eugene had won the victory of Blenheim in 1704. The victory at Ramillies, 1706, drove the French out of the Netherlands, and their attempts to regain their lost footing were foiled at Oudenarde (1708) and Malplaquet (1709). Louis now sued for peace, but the terms imposed were so humiliating that he preferred to continue the war. Circumstances came to the rescue of France; the death of Leopold I and of his son and successor, Joseph I, brought the Archduke Charles to the throne. To unite the thrones of Spain and the German Empire seemed even more menacing to the balance of power than to maintain the Bourbon king in Spain. In England the Tories, who had supplanted the Whigs, desired peace, and in 1713 was signed the Treaty of Utrecht, stipulating that the two lines of the Bourbon house should renounce all claims of inheriting from each other, and the two crowns should never be held by the same person.

War of the Austrian Succession.—As the Emperor Charles VI had no male heirs, he tried to obtain the accession of all the powers concerned to the Pragmatic Sanction, by which after his death all the Austrian possessions should be transmitted undivided to his eldest daughter, Maria Theresa. The nearest claimant to the Austrian inheritance, the Elector of Bavaria, never gave his consent to the Pragmatic Sanction, and when Charles VI died (October 20, 1740) a desire was manifested among the European powers to divide the Austrian dominions. Claims were advanced by Spain, Augustus III of Poland and Saxony, the King of Sardinia, and Frederick the Great of Prussia, to whom France was added by her traditional hatred of the Hapsburgs. Great Britain alone went to the aid of Austria. The Elector of Bavaria took possession of Bohemia in 1741, and in 1742 was crowned emperor. Frederick the Great seized Silesia. Maria Theresa appealed to her Hungarian subjects for aid. It was granted, and a period of Austrian success followed, due in part to the purchase of Prussian neutrality by the surrender of Silesia to Frederick; but the latter, alarmed by the success of the Austrians, again took the field in support of the emperor (1744). In upper Italy a French army joined the Spanish, and fought with great success, and in the Netherlands Marshal Saxe began his brilliant campaign with the victory at Fontenoy, May 11, 1745. Soon, however, events occurred which gradually prepared people's minds for peace. On January 20, 1745, the emperor, Charles VII, died, and Joseph, the husband of Maria Theresa, was elected Emperor of Germany as Francis I. Frederick the Great had become thoroughly disgusted with his allies, the French, and in the death of Charles VII he found an opportunity of retiring from the coalition; peace was concluded between Prussia and Austria, December 25, 1745. The war with France continued. Marshal Saxe gained brilliant victories in the Netherlands, and penetrated into Holland. The British, however, had nearly destroyed the French shipping and conquered many French colonies, and when Russia, in June, 1747, joined Austria, France was willing to make peace. Peace was concluded at Aix-la-Chapelle, October, 1748. Austria gave up Parma, Guastalla, and Piacenza to Don Philip, of the Spanish Bourbon line, several districts of Milan to Sardinia, and confirmed Frederick II in the possession of Silesia. See MARIA THERESA.

Suc'cory. See CHICORY.

Suck'er, any one of several fishes which have no resemblance to one another except that they "suck" in some way. They have ventral fins adapted for adhering to rocks and other bodies. The species are numerous, and each family is represented on the coast of the U. S.

Sucre (sô'krė), commonly called CHUQUISACA, and formerly LA PLATA, official capital of Bolivia and capital of the department of Chuquisaca; on a terrace of the E. Cordillera, and in the midst of magnificent mountain scenery, 8,840 ft. above the sea. It was founded by order of Pizzaro in 1539, on the site of the Indian village of Chuquichaca (golden bridge), and during the colonial period was renowned for its riches, derived from the silver mines of the vicinity. In 1826 the name was changed to Sucre, in honor of the first president. It remained the official capital, but during the civil wars it became customary for Congress to meet at La Paz, which is now virtually the capital of Bolivia. Remains of its former grandeur are seen in the fine cathedral and other public buildings. It has a university, the oldest in the republic, and is still the metropolis of the mining region and of a rich agricultural district. Pop. (1906) est. at 23,416.

Sudan', formerly sometimes SOUDAN or SOODAN, geographic name for that part of Africa lying S. of and adjacent to the Sahara, and extending, roughly, from 5° N. lat. to 15° N., and from 10° W. lon. eastward to the Nile. This region is occupied by many peoples and many different states, and embraces the basins of the Niger, Lake Chad, and the Bahr-el-Ghazal branch of the Nile, representing, respectively, W., central, and E. or Egyptian Sudan. The upper part of the basin of the Senegal is sometimes distinguished as the French Sudan. This, with the Kong country on the upper Niger, is mountainous, with elevated plateaus. Central Sudan is less elevated and generally level, but contains some high mountains (as Alantika, 9,800 ft.). French, W., and central Sudan are generally well wooded and watered, and of great agricultural capacity. The Egyptian Sudan is generally arid. The races occupying the Sudan are very varied, mostly Negroes (hence sometimes called Nigritia, or Negroland), but also including Fulas, Tuaregs, Arabs, and in the E., Shoas.

Khartum (14,823) is the capital of the Sudan provinces under British administration since 1899. Portions are also administered by France and Germany.

Sud'bury, mining town in N. Ontario, Canada. It is noted for the very valuable deposits of nickel in its neighborhood. These are accounted the most extensive in America. Pop. 5,000.

Su'dermann, Hermann, 1857- ; German dramatist and novelist; b. Matziken, E. Prussia; was a private teacher and journalist until he suddenly became famous by his drama, "Die Ehre," which, on account of the clever and sentimental treatment of the social question, achieved a remarkable success. His subsequent plays, "Sodoms Ende," "Die Heimat," and "Die Schmetterlingsschlacht," were less successful, and established the fact that their author had been overestimated. He also wrote a number of novels and short stories, of which "Der Katzensteg" is the best.

Sue (sü), **Marie Joseph Eugène,** 1804-59; French novelist; b. Paris; studied medicine, and was surgeon, first in the army, then in the navy, until 1829, when, having inherited a fortune, he devoted himself to literature. His first novels, "Kernock le Pirate," "Plick et Plock," "Atar-Gull," "La Salamandre," "La Coucaratcha," "La Vigie de Koat-Ven," were inspired by Cooper, and inaugurated in France the novel of naval adventure. In "Cécile," "Arthur," "Le Marquis de Létorière," "Jean Cavalier," "Thérèse Dunoyer," "Latréaumont," from 1835-38, he worked the historic, melodramatic, and romantic vein. After 1840 he became socialistic, and celebrated the proletariat in his most famous and popular novels, "Mathilde," "Les Mystères de Paris," "Le Juif Errant," "Martin," "Les Sept Péchés capitaux," "Les Mystères du Peuple." After the *coup d'état* he left France and settled at Annecy, in Savoy. He wrote about fifty volumes of novels not mentioned here.

Suetonius (swē-tō'nĭ-ŭs) **Tranquil'lus, Caius,** Roman author; b. probably about the beginning of the reign of Vespasian, d. abt. 160; employed by the Emperor Hadrian as his *magister epistolarum.* His principal work, "Duodecim Cæsarum Vitæ," has been preserved entire and in authentic form. It contains biographies of the first twelve Roman emperors, beginning with C. Julius Cæsar and ending with Domitian.

Suevi (swĕ'vī), originally a collective name, comprising several individual Germanic tribes which formed a kind of union. It is thus used by Cæsar and Tacitus. In the fourth century the name was applied to a single tribe, one branch of which settled along the Neckar (Swabia), while another branch broke into Gaul, and in 409 crossed the Pyrenees and penetrated into Spain, where they embraced Christianity, conquered Galicia, and formed a kingdom, which in 585 was united with the Visigothic Empire.

Suez′ Canal′, a ship canal connecting the Red Sea with the Mediterranean Sea. According to Diodorus Siculus (60 B.C.) there was a canal from the Gulf of Pelusium (not far from the present terminus of the canal) to the Red Sea. It was begun by Necos, continued by Darius, and finished by Ptolemy II. The canal was wide enough for two galleys to pass abreast.

In 1849 the project of a ship canal was taken up, to be carried through by Count Ferdinand de Lesseps, after delays due principally to the opposition of Great Britain, and it was not until 1859 that actual work was begun. A commission estimated 200,000,000 fr. as the cost of the work. A second concession was given on January 15, 1856, the terms of which were designed to satisfy the opposition which had already begun in Great Britain, and to guarantee fair returns to the stockholders who might invest, and the capital stock of the company was fixed at that figure. The viceroy made an official declaration for himself and his successors, subject to the ratification of the sultan, that the canal and all its ports should be open at all times as a neutral highway to every merchant ship passing from one sea to another, without any exclusive distinction or preference to persons or nationalities.

The Egyptian Govt. engaged to furnish a contingent of the fellaheen, and the work was at once begun. The location of the N. terminus of the canal was changed from Pelusium to Port Said. The first work of the canal was at this terminus, and was begun on August 25, 1859, by De Lesseps in the presence of about 150 persons.

From Port Said the distance across the isthmus in a direct line is about 70 m. The length of the canal is 100 m., of which over sixty per cent is through shallow lakes. The material excavated was usually sand, but in places it was necessary to blast through strata, 2 or 3 ft. in thickness, of solid rock. The total excavation was 80,000,000 cu. yds. The opposition of Great Britain to the employment of fellaheen labor, etc., delayed its completion and increased its cost. This necessitated the adoption of machines. The appliances thus used were various and very efficient. With them the contractors excavated 50,000,000 cu. meters, with the assistance of less than 4,000 men and in less than five years. The work was all performed in daylight.

The canal was opened November 17, 1869. The canal has a depth and width to permit the safe passage of ships drawing 25 ft. The following table shows the increase in the number of ships, tonnage, and receipts:

YEAR.	Number of Vessels.	Net Tonnage.	Receipts from Tolls and Passengers.
1870	486	435,911	$869,152
1880	2,026	3,057,421	7,501,627
1890	3,389	6,890,094	12,882,502
1894	3,352	8,039,106	14,770,081
1900	3,441	9,738,152	17,653,477
1906	3,957	13,445,504	21,069.938

The transit dues are now 7 fr. 75 cmes. per ton. The business of the canal became so great that it was necessary to widen and deepen it. The new dimensions are 31.2 ft. depth; bottom width, 108.2 ft.; surface width, 420 ft.; area of prism, 8,240 sq. ft. There are sidings—called *gures*—excavated for the passage of vessels at several points; the radius of the curves is 2,000 ft. The cost of the canal as originally completed was $95,000,000.

Suez, Gulf of, the W. and larger of the branches into which the Red Sea divides lying between Egypt and the peninsula of Sinai; length, 180 m.; breadth, 20 m. It is generally believed that the scene of the passage of the Red Sea by the Israelites is near the present head of the gulf.

Suez, Isth′mus of, a neck of land connecting the continents of Asia and Africa, and separating the Mediterranean from the Red Sea. Its extreme breadth from the Gulf of Suez to that of Pelusium is about 72 m. The surface is low and sandy, having an average elevation of not more than 6 or 8 ft. above the sea, but in places reaching to 50 or 60 ft. It is probable that the whole isthmus was once covered by the waters of the Mediterranean and Red seas, which were then connected.

Suf′folk, county of England; area, 1,475 sq. m. The surface is flat, and the soil for the most part productive and excellently cultivated. Wheat, barley, beans, oats, and hemp are raised, and butter is one of the principal products. Pop. (1901) 306,688; capital, Bury St. Edmunds.

Suf′frage, the act or right of casting a vote, either for some measure directly, as in a pure democracy, or for representatives in an assembly. The right has never been regarded as belonging without exception to all members of the community; it has always been limited in various ways, although it is less limited now than formerly. So-called "universal suffrage" means generally the admission to the ballot of all males who are of age, with the exception of unnaturalized citizens, mentally deficient persons, and those who have been convicted of crime. Thus, besides the three classes last mentioned, the vote is denied to all women and to all minors. On the other hand, unnaturalized citizens are allowed to vote in some localities, especially in local matters. When the suffrage is not "universal," the most common qualification is that of property, no one being allowed to vote who does not possess wealth of some kind to a certain amount or, sometimes, who is not a landholder. The limit may be small; in fact, states or countries nominally under universal suffrage commonly impose a small poll tax (three or four dollars), the payment of which is a prerequisite for voting, and which thus acts as a small property qualification.

In the Middle Ages suffrage was a right not so much of the individual as a citizen as of the member of some community regarded as entitled to representation in the law-making body. The community might be territorial, or it might be educational, mercantile, religious, or military. Even to-day the English universities return members to Parliament. In France and the Holy Roman Empire definite social ranks and orders had definite privileges, and were practically separate communities for electoral purposes. Thus, in England still, the upper House of Parliament is composed wholly of lords—a separate social order, and a definite division of this house consists of bishops representing the Established Church, an ecclesiastical body. Under these circumstances the idea that each vote of a person entitled to suffrage should count equally was, of course, not prominent. It became generally known first as a corollary of Rousseau's doctrine of the equality of man, according to which not only should every man have the right to vote, but one man's vote should count as much as another's. This will be the case only where the number of representatives is proportional to the voting population, which is often the case, even in this country, only in one branch of the legislative body. The Senators of the U. S. still represent communities (states) whatever their size. In Connecticut the Senate is the more popular body in the legislature, the members of the lower house representing towns, no matter what their population.

The general rule that the majority governs is held by many to be unfair, as it may practically disfranchise the minority. Hence many recent schemes for so-called minority representation, a number of which have been put into practice. Such, for instance, is the proviso that no one shall vote for the entire number of candidates to be elected, so that the minority, by concentrating its vote, may thus secure representation.

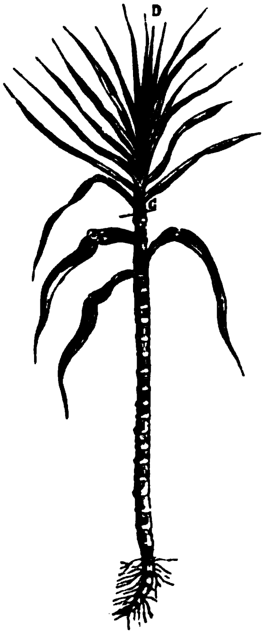
The suffrage, as noted above, is not usually extended to women, although in some countries they enjoy it partially and in a few wholly. Agitation for the extension of woman suffrage was begun about the middle of the last century, and has taken on a particularly active phase during the last few years, especially in England, where it has been carried on by public meetings and even by acts of disorder intended to call attention to what its advocates consider the injustice of withholding it.

Women voted for members of Parliament in England down to the seventeenth century, and they have always had some form of representation as property holders—in most European countries the *feme sole* (widows and spinsters) voting in person, the *feme covert* (married woman) by proxy, the husband casting her vote as well as his own. In this country New York (1778) was the first state to qualify the suffrage by inserting the word "male" in its constitution. As a consequence of the agitation begun in 1848, and resulting in the formation of the National Woman's Suffrage Association, school suffrage has now been granted to women by twenty-five states, municipal suffrage by Kansas (1887), and full suffrage in Wyoming (1869), Colorado (1893), and Utah (1895). Since 1895 women in Great Britain have voted for all officers except members of Parliament. In Canada, Cape of Good Hope, Australia, the presidencies of Madras, Bombay, and other British colonies, women householders vote at all municipal elections. In the Isle of Man women gained full suffrage in 1881, in New Zealand in 1893, and in S. Australia in 1895. In Russia, women who are heads of families vote for all elective officers and on all local questions. In Asiatic Russia, wherever there is a Russian colony, the *mir* or self-governing village obtains, and women householders vote. In Finland, Sweden, and Denmark they vote for all officers except members of Parliament. In Norway women have long had school suffrage, and they obtained full suffrage in 1909. In Austria-Hungary they vote (by proxy) at all elections, including those for members of provincial and imperial Parliaments. In Italy widows vote (by proxy) for members of Parliament. In Croatia and Dalmatia women vote at all elections in person. In France women teachers elect women on the boards of education. See FRANCHISE; DISFRANCHISEMENT; CITIZEN.

Su'fis, or Soofees, mystics of Islam, deriving their name from a coarse woolen cloak, their principal garment. Rabia, a Mussulman woman who lived not long after the prophet Mohammed, taught as her central doctrine divine love, and is reckoned by them their founder. Abu Saïd, son of Abul Khaïr, in the ninth century, advanced further, and urged abandonment of the world and consecration to a contemplative life. The various doctrines developed by his adherents and followers embrace every possible phase of mysticism. Many are pantheists and declare that God is all, but that all is not God. Some claim direct communication with the Deity, and a mysterious union with him. They are numerous in Persia, and have furnished noted scholars and poets.

Sug'ar, chemically defined as any carbohydrate soluble in water, but popularly sugar is any such compound having a sweet taste and usually denotes cane sugar (sucrose or saccharose) and sugars made from starch, known as glucose or grape sugar. The sugar of commerce is derived from sugar beets and sugar cane, the beets supplying about two thirds and the cane one third of the total supply. Minor sources of sugar are the palm, maple, sorghum, and starch. Sugar is formed in plants from the carbon dioxide and water in the air, and this sugar furnishes the principal food supply for the growth of all the other tissues of the plant.

The nations of remote antiquity were not acquainted with sugar as such, but used honey. The chief supply of sugar was furnished by the bees until the beginning of the fifteenth century. The sugar cane (*Saccharum officinarum*) came from India, though not found there, or elsewhere, in a wild state, and cultivated cane dies out when deprived of the care of man. Its yield of sugar has been raised by cultivation from 2 per cent to 15 or 16 per cent. The sugar beet, *Beta vulgaris*, originally came from Burgundy, and was carried by the Mennonite exiles into the Palatinate. From this locality it gradually spread to all parts of Germany, and was grown as cattle food. In 1747 Marggraf (1709–82) discovered that sugar could be obtained from the common beet. Achard (1753–1821), in Kaullsdorf, near Berlin, was the first who undertook a systematic culture of the beet, and he largely increased its content of sugar. In respect of the sweetening properties of pure cane and beet sugars there is no difference whatever between the two varieties.



Sugar Palm.

The maple tree is the sugar palm of temperate climates. Of the several varieties of this tree, only the *Acer barbatum* (also called *A. saccharinum*) is used to any extent for sugar making. The principal centers of the maple-sugar industry are in Vermont, New York, and Ohio, but almost everywhere in the NE. of the U. S., and also in parts of Canada, some sugar and molasses are made. Only the old trees are used for sugar making, and, until within a few years, the natural forests. Within the past few decades there has been some planting of maple trees for sugar producing, although a grove is not profitable for use until it is thirty or forty years old. In some few instances trees have yielded 40 lb., and yields of 20 lb. per tree are not uncommon. The average quantity of sap required to make a pound is sixteen quarts. It is probable that the average yield of all the trees from one season to another is about 3 lb.

Cane sugar, sucrose, or saccharose forms a molecule represented by the formula $C_{12}H_{22}O_{11}$. The world's production of sugar, 1909, was: Cane sugar, 7,935,000 tons; beet sugar, 6,775,000 tons. See Beet.

Sug'arberry. See Hackberry.

Sugges'tion. See Hypnotism.

Su'icide, intentional death by one's own hand. By the ancients suicide was considered neither a crime nor dishonorable. Demosthenes, Themistocles, Mark Antony, Cleopatra, Hannibal, and others having chosen this way of ending their days. The Scriptures furnish examples, as Samson, Eleazar, and Judas Iscariot. Mithridates and Hannibal died in this way rather than be taken prisoners. Others have committed suicide through false pride or timidity: a striking case in point was the death of Cato; determined not to live under the despotism of Cæsar, he stabbed himself, but, having fainted, his wound was dressed. When he recovered he tore off the bandages, let out his entrails, and expired. The Japanese form of suicide (hara-kiri), by ripping the bowels, was considered honorable and praiseworthy.

Many writers have defended this crime, the most able of whom were Mme. de Staël, Gibbon, Hume, Schopenhauer, and Von Hartmann.

Suicide has sometimes been epidemic in character, and is often suggested by sensational newspaper reports. But few suicides are committed by those whose brains are not impaired. Suicides are more often men than women by 3 to 1. There are half the number of suicides in Roman Catholic countries that there are in Protestant countries. The average number of suicides per million of inhabitants is: Denmark, 258; Germany, 175; Norway and Sweden, 100; France, 150; England and the U. S., each 70. Among uncivilized peoples suicide is practically unknown. It is peculiarly a disease of civilization. It is more frequent among the mercantile than among the professional classes, and more frequent among the responsible heads of institutions, business houses, etc., than among the dependent classes represented by clerks. See Felo-de-se; Hara-kiri.

Su'idæ. See Swine.

Suleiman (sō-lē-män'), or **Sol'yman,** name of Ottoman sultans, who follow:

Suleiman I, 1495–66; called the Great. His reign was a series of successful wars. In 1521 he crushed a rebellion in Syria and captured Belgrade; 1522 he subdued Rhodes, expelling the Knights of St. John of Jerusalem, whose stronghold it had been 214 years, who found an asylum in Malta; 1526 he broke the Hungarian power at the battle of Mohacz, slaying 25,000 Hungarians and bringing to Constantinople 100,000 Christian captives. Venice and Austria paid him tribute. He conquered Persian Kurdistan and partially subdued Georgia. His siege of Vienna was repulsed in 1529, and in 1552 the Austrians defeated his forces with fearful loss in their five months' siege of Erlau. Instigated by his favorite, Roxelana, who sought the succession for her son, he put to death his oldest son, Mustapha (1553). Enraged with his son Bayezid, who fled to Persia, he paid the Shah Tahmasp 400,000 gold pieces to insure the murder of the fugitive and of his four sons (1561). To break the naval power of Spain and control the Mediterranean he attacked Malta, but was defeated with the loss of 20,000 men (1565). Carrying on a last war with Austria, he died at the siege of Szigeth (1566), which, after an heroic resistance, fell three weeks later. During his reign the Ottoman Empire reached its acme and began its decline.

Suleiman II (1642–91). Timid and incapable, he committed the administration of affairs to his vizier, Kupruli Zadek Mustapha Pasha, the Virtuous, who was slain, with 28,000 Ottomans, at the terrible defeat of Selankemen (August 19, 1691), two months after the death of his master.

Suliotes (sō'lĭ-ōts), a band of 1,500 Albanian Christian warriors who forced the Ottomans to acknowledge their independence about 1730. From 1799 to 1803 they were besieged in their mountain fastnesses by Ali Pasha; their strongholds were gradually captured, despite desperate resistance, and they finally surrendered on favorable terms. The conquerors violated their oath, and men, women, and children were indiscriminately massacred. Only a few escaped. The story of the twenty-two Suliote women, who, rather than fall into the hands of the Ottomans, hurled their children from a precipice and then leaped after them, is everywhere known. Marco Botzaris was a Suliote. They were avaricious and haughty, but loved their freedom above all.

Sul'la, or **Sylla, Lucius Cornelius (Felix),** 138–78 B.C.; a Roman dictator. The family was originally called Rufinus and belonged to the Cornelia gens. In 107 B.C. he was elected quæstor, and was sent with cavalry to Africa to aid Marius. In 104 he was legate under Marius; in 103 he was military tribune; and in 102 he left Marius, who had become jealous of him, to serve under Q. Catulus. In 93 he gained the prætorship by the use of money. In 92 he was sent as proprætor to Cilicia to restore Ariobarzanes to his kingdom of Cappadocia, from which Mithridates had expelled him. In the Social War Sulla's successes far outshone those of Marius; his most brilliant exploits were in 89, when as legate of the consul L. Cato he destroyed Stabiæ, subjugated the Hirpini, defeated the Samnites, and captured Bovianum. In 88 he became consul, and was appointed to the command against Mithridates. Marius, who himself desired this command, succeeded in driving him out of the city. He hastened to the army then besieging Nola, persuaded six legions to march under him against Rome, and drove out Marius.

Early in 87 he began the war against Mithridates. In 86 he took and plundered Athens, and from this time till his return to Rome in 83 he enjoyed uninterrupted success. In the meantime Marius and L. Cinna returned to Rome and were elected consuls. Sulla was declared a public enemy, and an army was sent against both him and Mithridates under Fimbria. In 84 Sulla made peace with Mithridates and defeated Fimbria. Sulla, after exacting enormous sums from Asiatic cities, returned to Rome, shut up the younger Marius, the older being dead, in Præneste, defeated the Samnites and Lucanians before the Colline gate, November 1, 82, and then took Præneste, ending the Marian war. He slaughtered his Samnite prisoners and the Prænestines, and the younger Marius killed himself. Sulla now, as dictator, had absolute power over the lives and property of all citizens. A reign of terror followed. Fresh lists of proscribed persons constantly appeared, till Sulla was rid of his enemies. In 80 he was elected consul, and in 80–79 he introduced reforms in the constitution and established military colonies throughout Italy. He voluntarily resigned the dictatorship in 79, and retired to his estate at Puteoli, where he devoted himself to literary and sensual enjoyments.

Sul'livan, Sir Arthur Seymour, 1842–1900; English composer; b. London. He was early trained in the art, singing in the Chapel Royal when a child; at fourteen gained the Mendelssohn scholarship, which enabled him to pursue his studies under the best masters. For "The Tempest" of Shakespeare he composed incidental music. His compositions include overtures, symphonies, songs (including "The Lost Chord"), and piano music; the operettas "Box and Cox," "Thespis," and "Contrabandista"; the cantatas "The Bride of Neath Valley," "Kenilworth," and "On Sea and Land"; the oratorios "The Prodigal Son" and "The Light of the World," and an opera, "The Sapphire Necklace." Sullivan's greatest successes have been made with his comic operas, in which he had the invaluable collaboration of W. S. Gilbert. Beginning with "H. M. S. Pinafore" and followed by "The Pirates of Penzance," "Patience," "Iolanthe," "The Mikado," also "The Yeomen of the Guard," "The Gondoliers," etc., his popularity has been greater, perhaps, than that of any other English composer. He also wrote a grand opera called "Ivanhoe," which did not prove a success.

Sullivan, John, 1740–95; American general; b. Berwick, Me. In 1774 he was a member of the first General Congress. In June, 1775, he was appointed brigadier general, and commanded on Winter Hill at the siege of Boston. He took command of the army in Canada June 2, 1776, conducted the retreat from the province, was commissioned major general August 10th, and in the battle of Long Island, August 27th, contributed to the preservation of the American army. As successor of General Lee, he led the right at Trenton on Christmas night, 1776. On August 22, 1777, he made a bold descent on Staten Island, the entire success of which was prevented by misconstruction of his orders. At the battle of Brandywine he commanded the right wing. He defeated the British left at Germantown, but mistakes on the American left changed a victory into a repulse. August 29, 1779, he defeated the Indians under Brant and Tories under Sir John Johnson, at Newtown (near the present Elmira), N. Y.; member of Congress, 1780; 1782–86 he was Attorney-General of New Hampshire, and 1786–89, president of the state; 1789–95 he was Federal judge of New Hampshire.

Sully (sŭ-lē'), **Maximilien de Bethune,** Baron of Rosny (Duke of), 1560–1641; chief minister of Henry IV of France. A skillful administrator rather than a statesman, he made no radical changes, but reformed the finances so as to amass a large reserve, and greatly developed agriculture. He retired after the assassination of Henry IV.

Sul'phates. See SULPHURIC ACID.

Sul'phides, compounds of sulphur with metals or other elements.

Sul'phites. See SULPHUROUS ACID.

Sul'phur, or **Brim'stone,** an element abundantly distributed throughout the earth and the sea. It occurs native as a mineral. It is also found in gypsum and in a great variety of metallic sulphides; also dissolved in the ocean as sulphates. It is an essential element of the blood, muscles, skin, hair, and other parts of animals, and exists also in plants, though not in the woody substance. It is evolved also from volcanoes, both as vapor of sulphur and as gases.

Commercial sulphur is the native mineral purified by fusion or further by distillation and sublimation. Deposits of sulphur are reported in various parts of the U. S., as Louisiana, Nevada, Texas, and Utah, but the chief source is from iron pyrite. Refined sulphur (brimstone) and flowers of sulphur are products of distillation and sublimation. Roll sulphur is made by pouring the melted sulphur into molds.

Sulphur assumes various forms or allotropic states, which differ in crystalline or amorphous appearance and in their solubility in various liquids. Sulphur on heating passes through a succession of changes, melting at about 120° C. to a thin yellow liquid. If again cooled, it becomes a permanently transparent solid. Above 120° the sulphur becomes thick and viscid, losing its fluidity altogether and assuming a brown color at about 250° C. At 300° C. the mass again becomes liquefied. At 440° C. (824° F.) sulphur boils, forming an orange-yellow vapor. Some of the sulphur-allotropes are soluble in several liquids, such as bisulphide of carbon, oil of turpentine, etc. Sulphur inflames in air at a remarkably low temperature—about 482° F.—burning with blue flame and evolution of suffocating sulphurous oxide, SO_2.

Taken internally, sulphur produces little effect beyond that of a mild and somewhat slow laxative. Externally, applied as an ointment, it is a powerful parasiticide, especially useful in the itch disease. Potassium sulphide is a sharp irritant, and in large dose internally a corrosive poison. It may be used instead of the simple sulphur ointment in itch and other skin diseases, and dissolved in water as a bath is used in skin disease. In common with other sulphides, it is used as a depilatory.

Sul'phurets. Same as SULPHIDES.

Sulphureted Hy'drogen, or **Hydrosulphur'ic Ac'id,** a gas whose chemical formula is SH_2. It occurs naturally in some mineral springs and in volcanic regions. In combination with ammonia, it is evolved from putrefying organic matter, such as rotten eggs, which have its characteristic odor. SH_2 is artificially prepared by the action of a dilute acid upon certain sulphides, and is much used in analysis to determine the presence of any of a large group of metals and in the preparation of organic acids. It is a colorless gas. When inhaled SH_2 caused vertigo in some persons, though in others it may produce no apparent effect.

Sulphur'ic Acid and Sul'phates, a compound of sulphur, H_2SO_4, and its forms of combination. Sulphuric acid is called also oil of vitriol, from its having been originally obtained by distillation from vitriol, or sulphate of iron. This acid was probably known to the Arabian protochemists. Basil Valentine, in the fifteenth century, first mentions the making of sulphuric acid by distilling iron sulphate. The manufacture by burning sulphur, as now practiced, was introduced in England by Dr. Roebuck abt. 1720. The general method is to burn sulphur, either as brimstone or metallic sulphides, as pyrites, in a draught of air, which is passed into large lead-lined chambers, where the sulphurous oxide gas formed by the combustion is mixed with steam and nitrous fumes evolved from a mixture of saltpeter with sulphuric acid. The oxides of nitrogen in the presence of water oxidize the sulphurous acid to sulphuric acid and are themselves reduced to lower forms, which, in the presence of air, are converted into higher oxides, among which is nitrogen peroxide, NO_2, and thus again react with sulphurous acid, so that the operation of a limited amount of nitrous fumes is continuous, acting as a carrier of oxygen to the sulphurous dioxide without consumption of its own substance. The product precipitates with condensing steam upon the walls and floors of the leaden chambers as diluted sulphuric acid, which is then concentrated—first, in pans of lead, and then the boiling down is completed in stills of glass or platinum.

Sulphuric acid is an oily, colorless, inodorous liquid, which boils at 620° F. and freezes at − 31°. It absorbs water rapidly from the air, being one of the most useful agents for drying air and absorbing moisture from other substances. When mixed with water, great heat is developed. Nordhausen, or fuming sulphuric acid, is obtained by distilling ferric sulphate. It has the composition $H_2S_2O_7$, and is considered as containing sulphuric trioxide SO_3 or as $H_2SO_4.SO_3$. When gently heated, it breaks up into sulphuric oxide, which distills over and condenses as a solid body, and ordinary oil of vitriol remains. Its name of *fuming* acid comes from the fact of its forming white fumes in the air. Fuming oil of vitriol is used for dissolving indigo and as a reagent in gas analysis.

Among the products of science and art that constitute the pillars of modern civilization, sulphuric acid occupies a first rank. Probably no other except iron could be justly ranged with it in this regard. Indeed, it has been stated that the civilization of a country may be gauged by the amount of vitriol it consumes. This will appear on a mere enumeration of some of the products necessary to human life, health, comfort, luxury, or necessity, which are dependent, directly or indirectly, upon sulphuric acid as an essential agent in their production: soda from common salt, and through this, glass, soap, aluminum, magnesium; nitric and hydrochloric acids, upon which depend the arts of refining gold and silver, with the electroplater's and photographer's arts; artificial mineral waters, all the vegetable acids and alkaloids, alum, ammonia, ultramarine, the aniline colors, bleaching powder, chrome compounds, chloroform and ether, phosphorus and matches, artificial fertilizers, kerosene, and so on.

Among the compounds of sulphuric acid with metals are many of commercial value and importance which are described under the heads of the different metals. The following is a more complete enumeration:

Aluminum Sulphates.—Of these there are several, some of which occur as native minerals. The normal sulphate is $Al_2(SO_4)_3.18H_2O$, constituting the mineral *alunogen.* (See also ALUM.) *Ammonium Sulphate* $(NH_4)_2SO_4$, a commercial salt of importance, made from the ammoniacal liquor of gasworks, and used as a fertilizing agent. *Barium Sulphate,* the mineral *barite, barytes,* or *heavy spar* ($BaSO_4$), insoluble in water, very heavy, and the source of most commercial barium compounds. It is sold largely as a pigment or inferior substitute for white lead. *Calcium Sulphates,* represented by gypsum. *Copper Sulphate* (*Blue vitriol*), an important commercial salt. *Iron Sulphates* (*Copperas* or *green vitriol*), a large article of commerce. *Magnesium Sulphate, Epsom Salt.* See MAGNESIUM. *Nickel Sulphate,* very beautiful green crystals. This salt is of commercial importance by reason of its use in nickel plating. *Potassium Sulphate,* a considerable article of commerce for fertilizing purposes, for which it has great power.

Sulphuric E'ther. See ETHER.

Sulpic'ius or Sulpitius Sev'erus, abt. 365–abt. 425; ecclesiastic and author; b. Aquitania. He was descended from a noble family, and in his youth had a career of distinction at the bar and in public life open before him. The loss of his wife, to whom he was greatly attached, led him to abandon, abt. 392 A.D., the career on which he had entered, and to give himself up to solitude and religious meditation. He entered the Church, became a presbyter and a devoted admirer of St. Martin of Tours, whose life he wrote. His chief writings are "Chronica," in two books, from the Creation to 400 A.D.; "Vita S. Martini, Tres Epistolæ," all relating to his patron, St. Martin, and a sort of continuation of the "Life"; "Dialogi duo" (in some editions *tres*); to these are added "Epistolæ Septem," though doubtfully ascribed to Sulpicius.

Sul'tan, a title; first used by Mahmud of Ghazni (997–1030). It is assumed by many Mussulman sovereigns, as the rulers of Zanzibar, Borneo, etc., and is the common European appellation of the sovereign of the Ottoman Empire, who is sultan of sultans, though called by his Mussulman subjects *Padishah.* The feminine, sultana, is applied to the mother or daughter of a sultan. The masculine form precedes the name, as Sultan Mahmud; the feminine follows, as Nachshedil Sultana.

Sulu' or Suluk' Is'lands, a group of 162 small, mountainous, fertile islands in the Indian Ocean, extending from Borneo to Mindanao, Philippine Islands; between lat. 4° 44′ and 6° 56′ N., and lon. 119° 30′ and 122° 30′ E.; area, 1,948 sq. m.; capital, Sulu (officially, Jolo). Pop. 75,000, mostly Malays, addicted to piracy and the taking of slaves till conquered by the Spaniards in 1876, and since then chiefly engaged in pearl fishing and collecting edible birds' nests, the Sulu pearl or Manila shell being an important export. The islands yield sandalwood, teak, sugar, rice, coffee, spices, metals, and fish. The largest is Basilan (450 sq. m.), adjoining Mindanao on the N. Spain's claim to these islands was recognized in 1885, and they were ceded to the U. S., December 10, 1898; and in 1899 the Sultan of Sulu recognized the sovereignty of the U. S.

Su'mac, or Sumach, any plant of the genus *Rhus,* which includes about 120 species, mostly natives of warm or hot climates. In the U. S. there are about twelve species of sumacs, all of which are shrubs or small trees; of these the most common is the well-known smooth sumac (*Rhus glabra*), which is often found covering large tracts of barren ground, where it grows to a height of from 2 to 12 ft., with compound leaves a foot long. The yellowish-green flowers appear in June, and have a fragrant odor. The fruit is in dense crimson clusters with a velvety appearance and a pleasant acid flavor; the leaves are among the earliest to take on their autumn colors of yellow and scarlet. The stag's-horn sumac (*R. typhina*) sometimes reaches the height of 30 ft., and is readily distinguished by the soft down at the extremity of the branches. The dwarf sumac or mountain sumac (*R. copallina*) is rarely more than 6 or 8 ft. high, with dark shining leaves, which in autumn become a rich purple. A still more diminutive species (*R. pumila*) is found in the pine barrens from N. Carolina southward. The fragrant sumac (*R. aromatica*) ranges from Vermont to Florida, and as far westward as the Rocky Mountains; its leaves are among those which are smoked by the Indians in lieu of tobacco under the name of killikinick. The *Toxicodendron* group of the sumac family includes the two species, with white or dun berries and a very poisonous foliage, the poison oak and the poison ivy.

The sumac of commerce formerly consisted of the leaves of the *R. coriaria,* closely resembling the N. American stag's-horn sumac, cultivated in Sicily, and used in tanning, dyeing, and calico printing; but it has been proved that the sumacs of the U. S. are quite as valuable, and these are now prepared in parts of the South. The Japan wax is yielded by the *R. succedanea,* being prepared from the white coating of the seeds within the capsules. The Japanese lacquer is prepared from the juice of *R. vernicifera,* a shrub resembling the poison sumac of the U. S. The Chinese galls are the result of the deposition of the eggs of an insect on the leaf stalks and young shoots of *R. semialata,* and are largely imported into England for dyeing and tanning. Botanically, the sumac family (*Anacardiaceæ*) includes the cashew and pistachio nuts, and the mastic and mango trees.

Sumatra (sô-mä'trä), island, extending from NW. to SE., between lat. 5° 45′ N. and 5° 55′ S., and between lon. 90° 40′ and 105° 5′ W., divided by the equator into two equal parts; length, 1,115 m.; breadth, 275 m.; area, 162,608 to (with coastal islands) about 180,000 sq. m.

Through its length Sumatra is traversed by a range, Bukit Barissan, which reaches its greatest height, 9,655 ft., in Ophir. The principal rocks are granite, syenite, gneiss, mica, slate, and red sandstone, none of which are found in Java, whose formation is entirely different from that of Sumatra. Six volcanoes are situated near the equator. The SE. part is rich in streams, navigable even for large vessels far into the interior. These streams carry large masses of mud and earth to the sea, the result of which is a considerable extension of the coast line; at the same time the island, like Java and Borneo, appears to be rising slowly but steadily. The climate varies, but is generally healthful, with the exception of the low coast regions to the W. The heat varies on the coast between 82° and 86° F., at an elevation of from 2,500 to 3,000 ft. between 64° and 73°; these highlands are known for their healthful climate. The monsoons are not so steady and regular as elsewhere.

The natural productions are more varied and more abundant than in any of the other islands. Of metals, gold, iron, copper, and tin abound; brown coal occurs, but not anthracite. Petroleum abounds, and is exported. Rice forms the principal food, then sago, beans, and roots. Among the fruits are many which thrive only here, and cannot be introduced into other countries. Of trees, the *Sideroxylon* (justly called iron wood) yields the best wood for shipbuilding, it being so hard that it blunts the sharpest arrow; teak is not found. The most important plants entering into commerce are cotton, black pepper, caoutchouc, benzoin, gutta percha, dyestuffs, and camphor, for which the island was celebrated among the ancients. The Dutch have introduced coffee, tobacco, and cacao. The fauna corresponds nearer to that of Borneo than to that of Java. Of mammals there are eighty species, among which are the elephant, rhinoceros, tapir, tiger, panther, and bear; among the many species of apes are the orang-outang and two gibbons, the siamang, and the wau-wau; the buffalo occurs both wild and domesticated; the horse is small, but vigorous.

The pop. (with coastal islands), about 4,000,000, is chiefly Malayan. Sumatra was the cradle of the Malays as a nation; in the interior they founded the empire of Manang-Kaban. Next to them the Battas are the most important division; they formerly inhabited the country N. of lat. 1° N., but the population of Achin has separated from them, and they themselves have decreased in number. The Malays are all Moslems. The Battas are fetich worshipers, and addicted to cannibalism—a custom which the Dutch have tried in vain to abolish. Ptolemy calls the island *Aurea Chersonesus*. The Arabs visited Sumatra abt. 860 A.D.; Islamism was introduced into Achin, 1205; Marco Polo landed here in 1290; the Portuguese under Alvaro Talesso in 1506, the Dutch in 1597; an English squadron appeared before Achin in 1602. The Dutch East India Company established settlements on the E. coast, 1618. Great Britain tried to compete, but was compelled in 1783 to return all its possessions in Sumatra to Holland. In 1811 it once more occupied the island, but by treaty of March 17, 1824, exchanged all its possessions in the archipelago for the Malayan peninsula. Since then the Dutch have been occupied in gradually extending their conquests over the entire island. The last to hold out were some tribes of the Battas in the interior.

Sumba'wa, island of the Sunda Islands, Dutch E. Indies, E. of Java, between Lombok and Flores. Area, 5,400 sq. m. It is high, mountainous, and volcanic. The still active volcano Tambora, on the N. coast, 8,940 ft. high, caused a terrible destruction by its eruption in 1815; the ashes fell in Sumatra, 840 m. distant, and more than 12,000 people are said to have lost their lives. Another eruption, less destructive, occurred in 1836. The principal products are gold, sulphur, saltpeter, rice, various kinds of wood, and a fine breed of horses. The inhabitants, 150,000 in number and closely allied in habits and manners to those of Celebes, live in four states which are under Dutch authority.

Sume'rians, the people who are believed by most Assyrian scholars to have occupied Babylonia before the Semites appeared in that region; to have invented the cuneiform script; and to have been the teachers of the Semites, by whom they were finally displaced or absorbed. It would seem that there were two branches of this people—the Sumerians and the Akkadians.

Sum'mer, the warm season of the year, including astronomically the time between the vernal and autumnal equinoxes, or from about June 21st till about September 22d. The calendar summer comprises in the U. S. June, July, and August; in England, May, June, and July. The Indian summer is a period of warm, pleasant weather, which usually occurs every year over the N. portion of the U. S. after the autumnal storms, and continues often without interruption two or three weeks.

Summer Duck. See WOOD DUCK.

Summer Teal. See GARGANY.

Sum'mons, in law, a writ addressed to the defendant in a personal action, admonishing him to appear in court. It must contain the names of all the defendants, the name and address of the person taking it out, and the date of issue; but it need not state the form or cause of action. A summons should be served on the defendant in person; but if reasonable efforts are made to do this, and the defendant is aware of its issue, the judge may authorize the plaintiff to proceed in the action without personal service.

Sum'ner, Charles, 1811-74; American statesman; b. Boston, Mass. He graduated at Harvard, 1830; studied law; was reporter of the U. S. Circuit Court, and published three volumes ("Sumner's Reports") containing decisions of Judge Story. He also edited the quarterly *American Jurist*. He took no active part in politics till 1845, when on the Fourth of July he made in Boston an oration, "The True Grandeur of Nations," a plea for peace, which was followed by a succession of public addresses. He opposed the annexation of Texas, on the ground of slavery. In the Presidential canvass of 1848 he supported the Free Soil candidates, Van Buren and Adams. In 1851 he entered the U. S. Senate as the successor of Webster, and retained his seat till his death. His first important speech was in opposition to the Fugitive Slave Act. In the debate on the repeal of the Missouri Compromise and on the contest in Kansas Sumner took a prominent part. His last speech upon this topic was delivered on May 19 and 20, 1856, and was printed under the title of "The Crime Against Kansas." Some passages in it greatly incensed the members from S. Carolina, one of whom, Preston S. Brooks, on May 22d assaulted Sumner while he was writing at his desk in the Senate Chamber, and with a cane struck him on the head till he fell to the floor insensible. The injury thus received was followed by a severe and long disability, from which his recovery was not complete till three or four years later.

Sump'tuary Laws, laws to restrict and regulate private expenditures, generally aimed at extravagant outlays for food, clothing, or funerals. Such laws were enforced by every nation of the Old World, and have been indulged in even by the modern states of N. America. For example, Massachusetts thought it necessary at one time to regulate the cost of funerals. One of these statutes (10 Ed. III, st. 3), ordaining that no man should be served at dinner or supper with more than two courses, except upon certain holidays, when he might be served with three, was not repealed until the nineteenth century.

Sumptuary laws have not, however, always been directed to check extravagance. In England the wearing of silk on garments was prohibited so as to promote the domestic wool trade, and shrouds were required to be of wool. In our day the term sumptuary is often applied to laws restraining the liquor traffic. They are dealt with by the courts, however, as police regulations. Under the Federal and state constitutions of the U. S., with their guaranties of individual liberty, it is held that the habits, occupation, food, and drink—the life of the individual—are severally matters for his own determination, subject only to considerations of public health and safety. See PROHIBITION.

Sum'ter, Thomas, 1734-1832; American military officer; b. Virginia, but early removed to S. Carolina. In 1776 he was made lieutenant colonel of militia, and after the capture of Charleston by the British (1780) he took refuge in the swamps of the Santee, and, with the rank of brigadier general, became an able leader of the South. Member of convention which adopted the Federal Constitution; member of Congress, 1789-93 and 1797-1801; U. S. Senator, 1801-9; minister to Brazil, 1809-11. He was the last surviving general of the Revolution.

Sumter, Fort. See FORT SUMTER.

Sun, for us, the most important body in the universe, next to the earth. It is the center around which the planets revolve, and without its vivifying influence the earth would speedily be enveloped in a mantle of ice, on which no living being could exist. In volume it is more than a million times that of our earth; in mass more than 300,000 times. Its density is about one fourth that of the average of the materials which make up the earth, and therefore only about half as much again as that of water. Its mean distance from us is 93,000,000 m.; its diameter, 866,000 m. The force of gravity on its surface is twenty-seven times what it is on the earth. Under such circumstances a man attempting to stand up would be crushed to death by his own weight. Like the earth and planets, the sun rotates from W. toward E. on an axis nearly perpendicular to the ecliptic. The period of rotation is about twenty-six days.

The flood of heat which the sun sends us at its enormous distance indicates that the matter composing it is intensely hot—probably more than 10,000° F. The interior must be at a much higher temperature. At such a temperature as that within the sun no permanent chemical combination is possible. There can be only an indiscriminate mixture of elements. We must regard the sun as a mass of gas, condensed nearly to the density of a liquid by the pressure of its own mass. The visible photosphere is sometimes supposed to be partially solid. It may be that, under the influence of rapid cooling, the substances which rise to the surface are constantly condensing to solids, and then falling down again are once more melted by the heat of the interior; but a purely gaseous envelope around the sun would increase so rapidly in density toward the interior, owing to the immense pressure of gravity, that it would present the same appearance that the sun actually does.

Through a good telescope, under favorable conditions, the photosphere is seen to have a mottled or curdled appearance, looking much like a plate of rice soup. This appearance probably arises from a constant rising of currents of heated matter from the interior. The most striking feature of the photosphere is formed by the spots, which may nearly always be seen when the sun is examined with a telescope. When examined with a high power, a sun spot is found to possess marked peculiarities. A general idea of the appearance may be formed from Fig. 1. We have in the center a dark portion, called the nucleus, or umbra, which is commonly of irregular form. The word dark must, however, be interpreted in a relative sense; though apparently dark by contrast, the spot would be intensely bright if isolated. Around this dark center is a gray fringe intermediate in brightness between the nucleus and the photosphere, which is called the penumbra, and has a striated or fibrous appearance, being composed of an immense number of rootlike filaments directed from the outside toward the center. Groups of minute specks, brighter than the general surface of the sun, are often seen in the neighborhood of spots or elsewhere, and are called faculæ.

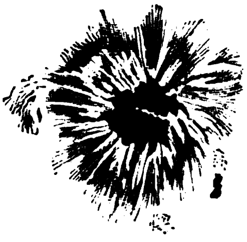


FIG. 1.

The spots vary in size from the smallest visible points to objects large enough to be seen with the naked eye, and therefore nearly 100,000 m. in diameter. The spots are not seen all over the solar disk, but only near to what, in our globe, would correspond to the tropics.

They frequently appear in groups of two or three, sometimes more. In consequence of the sun's rotation, each spot moves slowly across its disk, occupying about thirteen days from the time it appears on one side until it disappears on the other. The duration of a spot is variable, ranging from a few days to several months.

Sun spots are supposed to be cavities in the photosphere, or cooled portions of matter floating upon the photosphere, or down rushes of matter, carrying the cooler portions with them. The frequency of the sun spots goes through a fairly regular period of about eleven years. In recent years the maxima have occurred about the years 1848, 1860, 1870, 1881, 1892, and 1904. During the years of maximum the sun is rarely seen without spots, and generally with a considerable number. During the intermediate years of minima the sun is seen without spots about half the time. The fact seems to be that the variation occurs in consequence of a cycle of changes going on within the body of the sun itself, but of the nature of those changes nothing is known. (See Corona and Eclipse.) The photosphere is surrounded by a comparatively thin layer of vaporized or gaseous matter, known as the chromosphere. Continuous with this layer, and yet possibly having a different origin, are the protuberances, which appear to consist of vast masses of glowing gas ejected from the sun with inconceivable force, the velocity sometimes amounting to 200 m. a second. These protuberances exhibit a variety of fantastic forms, sometimes appearing like immense flames, sometimes like clouds floating above the sun and remaining for hours, or even days, in the same region. They are more frequently seen in the neighborhood of sun spots than elsewhere, yet not necessarily over the spots. Some of the forms are shown in Fig. 2, on a scale on which the earth would be represented by a globe of perhaps one eighth of an inch in diameter.

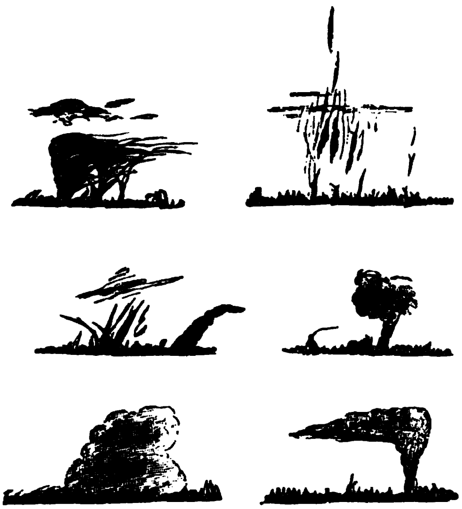


Fig. 2.

The coronal light can be plainly seen extending to a distance from the sun nearly equal to its semidiameter, but it also shows rays or streamers extending to much greater distances, even millions of miles in extent.

Magnetic force may very well account for the structure and appearance of the corona, but the difficulty is how substances of any sort can remain at rest so near the sun, under the enormous gravitating force of the latter. The corona has been described as a solar atmosphere, but it cannot be such in the sense in which we use the term. The fact that comets have passed through its substance with a speed of several hundred miles a second, without suffering, so far as could be seen, the slightest retardation or disturbance, shows that there can be in the corona no substances but such as are of the utmost tenuity—particles so light that the thinnest air would be as lead in comparison. It has been suggested that these particles may be held up by electrical repulsion, or that they may be in a state of projection, continually thrown up from the sun and falling back again upon its surface. A comparison of the solar spectrum with the spectra of the various elements found on the earth shows that the sun is composed very largely of the same substances as the earth. Of these, calcium, iron, and sodium are among those most strongly marked.

The question whether the sun affects the earth otherwise than by its light, heat, and gravitation is one with which science is busy, but on which no positive conclusions are yet reached. A relation between the period of the aurora and that of the sun spots seems to be not improbable, but the question whether auroras are themselves excited by actions going on in the sun is an open one. To our ancestors there was no apparent reason why the sun should not continue to light and warm the earth and planets forever; but modern science shows that the radiation of heat from the sun to the earth involves a continuous expenditure of an agent called energy, of which the supply is necessarily limited. If the amount of heat falling on a square centimeter were transformed into a lifting force, without any loss whatever, it would raise a cubic centimeter of water against the force of gravity at the rate of about 4,800 ft. per minute. A similar computation shows that the heat which the sun, when near the zenith, radiates upon the deck of a steamship would suffice, could it be turned into work without loss, to drive her at a fair rate of speed. Considering the sun simply as a hot body, it would be cooled by the heat which it radiates, and calculation shows that the amount of heat radiated would result in a cooling of 5°, more or less, per year, according to the specific heat of the substances which compose it. It follows that, in such a case, the sun would cool off entirely in a very few thousand years. As no actual cooling seems to take place, the question arises how the heat is kept up.

Two theories have been maintained. One, the meteoric theory, is that the countless meteors which are moving in all directions through the solar system are continually falling into the sun and supplying it with the heat generated by the impact. As to this theory, it can only be said that it seems impossible that meteoric matter in sufficient quantity could be falling into the sun. The other theory is that the heat is kept up by the contraction of the sun's volume as it cools. This, however, does not mean that the heat would last indefinitely. After contracting to a certain point the matter composing the sun would necessarily begin to assume a solid or liquid form, and then would rapidly cool off. The available supply of energy would then be exhausted forever, and our system would be overtaken by eternal cold and darkness. From the known amount of heat which it radiates we can even, in a rude way, calculate the probable length of its life. From fifteen to twenty millions of years seems to be the limit of its age in the past, and it may exist a few millions of years, perhaps five or ten, in the future. There is no reason to apprehend any sudden or rapid changes in the supply of solar heat. See SOLAR SYSTEM.

Sun'bird, any bird of *Nectariniidæ*, inhabiting a great part of Africa, S. Asia, and Australasia. They have a superficial resemblance to the humming birds in their smallness, slender build, brilliant, often metallic colors, and habits of feeding from flowers, but belong to a different order, the passerines. Their food consists mainly of insects. Their nests, which are roofed over, are swung from a slender twig or the tip of a leaf; the eggs, generally three, are white, plentifully sprinkled with grayish green. There are over 100 species.

FIERY-TAILED SUNBIRD.

Sun'da Is'lands, the chain of large islands belonging to the Malay Archipelago, which, beginning with Sumatra and ending with Timor, separates the Java Sea from the Indian Ocean. The name is derived from the indigenous name of the W. part of Java, adjoining the Sunda Straits. Most of them belong to the Netherlands.

Sun Dance, a ceremony formerly practiced by the Sioux, Cheyennes, and other Indian tribes of the plains to propitiate the sun god. As it involved self-torture and other objectionable features, it has been suppressed by the Federal authorities.

Sun'day, the secular name of the first day of the week, which is held among Christians as a Sabbath, or rest day. As soon as the Christian religion was recognized by the state, laws were enacted for the observance of Sunday. Constantine (321) prohibited all business except agricultural labor and all legal proceedings except the manumission of slaves. Subsequent emperors made similar enactments. In England Sunday laws were of very early origin. The common law distinguished Sunday from other days by allowing no judicial acts on that day. The statute 5 and 6 Edw. VI, c. 3, makes Sundays, with Christmas, Easter, etc., holidays, but permits work in harvest and in other cases of need. The statute 1 Eliz., c. 2, punishes by fine persons absenting themselves from church without excuse. The most important of the English statutes is 29 Chas. II, c. 7, which prohibits all worldly labor or business (works of necessity and charity only excepted), the sale of goods, traveling for purposes of trade, and the serving or executing of any process or warrant, except in case of treason, felony, or breach of peace. The dressing of meat in families and its sale in inns and eating shops and the crying of milk before nine and after four are allowed. This statute, later modified by laws, is the present Sunday law of Great Britain, and lies at the basis of the Sunday laws of the U. S. The early laws of Massachusetts, Connecticut, Georgia, S. Carolina, and Virginia also compelled attendance at church. In most of the states common labor and traffic are prohibited; contracts made or for service on Sunday are invalid; public amusements are restricted or forbidden. The constitutionality of Sunday laws has been decided frequently by the highest state courts. See SABBATH; BLUE LAWS.

Sunday Let'ter. See DOMINICAL LETTER.

Sunday Schools, gatherings for religious instruction and worship, in which the learners are clustered in classes under separate teachers, all the classes being associated under a common head, and the form of instruction being interlocutory or catechetical. Although many single schools were of earlier date, modern Sunday schools had their origin in a movement begun by Robert Raikes in Gloucester, England, July, 1780. His purpose was to provide instruction in reading, and in the Church of England catechism, for the neglected children of that city. His first school was gathered on a Sunday in a private house under the charge of four women, who were employed at a shilling a day. Its forenoon session was from ten to twelve o'clock. In the afternoon, after a brief session, the children were conducted to the parish church for a part in worship, and were afterwards examined in the catechism. The Rev. Thomas Stock, a parish clergyman, assisted Mr. Raikes in this work, and gave an extra sixpence a day to the teachers.

Descriptions of this movement called attention to it, and it soon became widely popular. Volunteer teachers took the place of paid ones. John Wesley introduced its plan of work into his religious operations. The success of the movement was quickly assured, though it met with ecclesiastical opposition.

Among the Jews religious instruction, apart from that which was given in the family, seems to have been practiced in the days of Abraham

(Gen. xiv, 14). According to the Talmud and to Josephus, a system of religious schools in connection with the synagogues was organized in the century before Christ. The size of classes was limited to the capability of the teacher. Selected Bible lessons were arranged for a series of years. Freeness in questions and answers was cultivated. Such schools were general in Palestine in the days of Jesus.

In the U. S. a Sunday school was organized under the direction of Bishop Asbury at the house of Thomas Crenshaw, in Hanover Co., Va., in 1786; yet little is known of it save its beginning. Now Protestants and Roman Catholics alike recognize its importance, and it is in favor among the Jews as among Christians. Its management varies according to the ecclesiastical systems of which it has become a part, but its main features are alike throughout. According to the statistics reported by the Twelfth International Sunday School Convention (1908), there were in the world 244,528 Sunday schools, 2,411,373 teachers, and 22,572,858 scholars. In the U. S. there were 140,519 schools, 1,451,855 teachers, and 11,329,253 scholars.

Sun'derland, town; in county of Durham, England; at the mouth of the Wear; 12 m. SE. of Newcastle-upon-Tyne. The borough includes townships on the S. side of the Wear, and Monkwearmouth on the N. side. Sunderland is a well-built modern town with broad streets. It has large piers and docks capable of receiving the largest vessels. The shipments of coal and coke average upward of 4,000,000 tons. Glass, earthenware, iron, lime, cement, and chemicals are also exported. The principal imports are iron ores, timber, chalk, and agricultural produce. Shipbuilding is largely carried on. In Monkwearmouth is one of the deepest collieries in the world (381 fathoms). Pop. of the municipal borough (1906) est. at 157,693.

Sun'dew. See DROSERA AND INSECTIVOROUS PLANTS.

Sun'dial. See DIAL.

Sun'fish, a name given to different aquatic animals on account of their brilliant colors, shape, or habit of basking in the sun. (1) In the U. S. and Canada it is most frequently applied to fresh-water fishes belonging to the *Centrarchidæ*, and chiefly to the genus *Lepomis*. The colors are always quite brilliant. The species are numerous. The best known in the N. states are: The *L. gibbosus*, the common sunfish of New England and the middle states, and is recognizable by the ear flaps being black, tipped with scarlet, and by the orange spots of the sides. The *L. auritus* has long black but bluish-edged ear flaps. The *L. pallidus* has squarish black ear flaps. Wherever found, they are generally among the most common fishes. They are carnivorous and bold, and take a hook baited with the common earthworm. Many of the species build curious nests. (2) On the sea coast, to some extent, but more especially in Great Britain, the name is given to species of *Orthagoriscus* or *Mola*, fishes of an almost circular outline. (3) In some parts of England the name is also applied to the basking shark. (4) It is also frequently applied by sailors to floating acalephs or jellyfishes.

Sun'flower, the *Helianthus annuus*; a coarse and tall annual plant of the *Compositæ*. It is often seen in gardens. It is a native of the Great Plains of N. America, where it grows in abundance. In Europe the plant is raised for its seeds, which afford a good drying oil, nearly equal to linseed. The leaves are fed to cattle, the seeds to poultry, and the flowers yield honey. In tropical America the sunflower often attains a height of 20 ft., and produces a flower 1 to 2 ft. in diameter. In S. Europe it is cultivated as a field crop for its seed. See COMPOSITES for illustration.

Sunflower Fam'ily, another name for the COMPOSITES (*q.v.*).

Sun'stroke, or **Ther'mic Fe'ver,** a fever due to the effect of excessive heat or of exposure to the direct heat of the sun, on the nervous centers at the base of the brain. Reduction of the excessive fever by application of cold water or ice to the body of the patient is the first requisite treatment. Where the circulation is failing, digitalis should be given hypodermatically. Heat exhaustion, due to exertion while subjected to heat, is characterized by depression of the temperature of the body, pallor, and, in severe forms, unconsciousness. The use of external heat, and such stimulants as digitalis, atropine, and strychnine must be resorted to. In both forms of the disease, prompt treatment may avert death from paralysis of the controlling mechanism of respiration and circulation in the brain.

Sun Wor'ship, commonly regarded as one of the characteristic features of the religion of ancient Persia. The Peruvians of old, who worshiped every aspect of nature, paid the chief honors to the sun. The Egyptians, the Greeks, the Italians of antiquity, and the Celtic and Teutonic races, the E. Indians, and some Africans, were, as some heathen races still are, sun worshipers. Sun worship is one of the most widely diffused forms of nature worship, the genial and fructifying warmth and brightness, the mysterious nature, and the constant course of the great luminary appealing powerfully to the religious feelings of the ruder peoples.

Supereroga'tion, Works of, in the Roman Catholic Church, good works performed by a Christian over and above his simple duty. These works constitute a fund of merit which is applied to the relief of souls in purgatory. The definition is based on a distinction between what is commanded and what is only counseled.

Supe'rior, city; capital Douglas Co., Wis.; at the head of Lake Superior, opposite Duluth, Minn. It has three perfect landlocked harbors, all connected, with total length of 13 m. and width, 1 to 3 m.; an important railroad center. The climate is crisp, dry, and healthful, with average temperature for twenty years, 40°; average number of fair days per annum,

260. The water supply is from Lake Superior, and the sewerage system, planned when the city was laid out, is sufficient for a city of 1,500,000 people. The manufactures are chiefly flour, lumber, lath, shingles, iron, chairs, barrels, bags, coke, and woolen goods. Besides the shipping facilities furnished by the railways, the city has exceptional facilities for receiving and shipping freight by water. Pop. (1906) est. at 37,643.

Superior, Lake, the largest of the Laurentian chain of lakes. It is the largest fresh-water lake in the world and the largest inland-water body except the Caspian Sea. Its area is 30,829 sq. m. The only possible rival to Lake Superior in size is Lake Victoria Nyanza (estimated 27,000 sq. m.). The mean elevation of the surface of Lake Superior is 602 ft. above the sea and 20 ft. above Lake Huron, into which it discharges through St. Mary's River. Its greatest measured depth is 1,008 ft. Its hydrographic basin, including the lake surface, has an area of about 85,000 sq. m. The discharge through St. Mary's River is estimated at 86,000 cu. ft. per second. In the deeper portions of the lake the temperature varies little from 39° F., the temperature of water at its maximum density.

The boundary between Canada and the U. S. passes through the lake, about one third of the area of the lake belonging to the Dominion. The N. shore is formed of crystalline rocks, and in places is bold and picturesque. The S. shore is mostly low and covered with blown sand, glacial deposits, and fine pinkish clays, which were deposited from the lake during a former high-water stage, when it extended for many miles S. of its present boundaries. The Pictured Rocks, about 100 m. W. of the outlet of the lake, are cliffs of sandstone, formed by the edges of nearly horizontal strata, and, together with other bold features about the lake, are remnants of an old topography which was fashioned by stream erosion and weathering previous to the Glacial period. The land bordering Lake Superior is not well adapted for agriculture, but rich deposits of copper and iron and abundant forests of pine, together with fisheries and facilities for transportation which the lake affords, have led to rapid developments.

Suppé (sŏp-pā'), **Franz von,** 1820-95; Austrian opera composer, whose baptismal name was Francesco Ezechiele Ermengildo Cavaliere Suppé Demelli. He very early manifested musical talent, and at fifteen composed a mass. After study with the best masters, he became conductor at the Josephstadt Theater, Vienna, succeeded by other similar engagements. His first operatic work was "Sommernachtstraum," founded on Shakespeare, in 1844. Then came a long list of operettas. In the U. S. he is best known by his "Fatinitza," "Boccaccio," and his overture "Poet and Peasant."

Sup'per, Lord's. See EUCHARIST.

Suppura'tion, a form of inflammation which goes on to the development of pus or matter, as in abscesses, inflammations of the mucous membranes, and in wounds. Although pus may be otherwise produced, for practical purposes it may be regarded as the result of a conflict between invading pus-producing bacteria and the white blood cells. In studying the process microscopically it is found that, as in other forms of inflammation, the white blood corpuscles of the blood leave the vessels and accumulate in the tissues; at the same time a quantity of the fluid part of the blood exudes. Eventually the cellular exudate softens by degeneration and yellowish pus results. At the same time the surrounding tissues produce a wall of young cells around the suppurating focus, and thus an abscess with a retaining wall is formed. The true pus corpuscle is a white blood corpuscle which has emerged from the blood vessels and undergone more or less degeneration.

The symptoms indicative of suppuration are those of inflammation—heat, redness, pain, and swelling; but the pain has often a peculiar throbbing character, and the swelling is found to be fluctuating or elastic. In addition, general fever of irregular type, sweats, or chills may be noted; and general infection (pyæmia and septicæmia) may occur. The treatment of suppuration consists in abortive measures, and, these failing, in measures to promote "pointing" and in the evacuation of the abscess. Applications of cold are most useful for the first purpose; for the second, heat, and especially poultices. After the development of fluctuation, incision should be made, the pus cavity cleaned, and then, if necessary, packed so that it may drain and granulate from the bottom.

Suprem'acy, Act of. See ACT.

Suraba'ya, town on the N. coast of Java; capital of the Dutch province of Surabaya; opposite Madura, at the mouth of the Kediri. It has a good harbor and is strongly fortified. It is a station on the railway from Surakarta to Probolingo, communicates regularly with Samarang, Batavia, and other places by steamboats, and carries on an important trade, exporting annually rice, coffee, cotton, sugar, tobacco, and cocoanuts. Its shipbuilding is also extensive. Pop. (1905) 150,198, of whom 8,063 are Europeans, the rest Javanese, Malays, and Chinese.

Surakar'ta, town of Java; capital of the Dutch residency of Surakarta; on the left bank of the Solo; connected with Samarang and Surabaya by railway. It contains a magnificent palace of the native emperor, who lives here as a pensioned rather than as a tributary prince; the Dutch fortress is opposite the Emperor's palace. The trade is very large, especially in pepper, vanilla, and cacao. Pop. (1900) 109,459.

Surat', town in Bombay, British India; on the Taptee. It is 6 m. in circumference, and surrounded by walls surmounted by towers. It is said to have had 800,000 inhabitants at the end of the eighteenth century, but its manufactures died out, its trade is lost, and many of the Dutch, French, and Portuguese establishments are deserted. The place is most important from a military point of view. Pop. (1901) 119,306.

Sure'ty. See GUARANTY; SURETYSHIP.

Sur'gery, that branch of medical science which has for its object the treatment by manual operations of all lesions or malformations of the human body. Pictures have been found among Egyptian and Assyrian ruins displaying instruments and operations not unlike many in use in modern times. The surgical attainments of the early Greeks seem not to have extended further than the extraction of darts, the suppression of hemorrhage by pressure or styptics, and the application of lenitive salves. Homer says that when the warriors at the Trojan siege sustained fractures of the bones, recourse was had, as when pestilence arose, to invocations to the gods. Hippocrates, b. abt. 460 B.C., commended some operations that have only of late years been acknowledged to be legitimate surgical resources, such as tapping the chest for empyema, nephrotomy for calculus lodged in the kidney, and trephining the skull for persistent headache. He was familiar with cataplasms and venesection and cupping; with operations on ranula, nasal polypi, and ganglia; with the treatment of piles and fistulæ by ligature; with tapping in dropsies. Erasistratus was a bold surgeon, not hesitating to excise portions of the liver and spleen; he invented a metal catheter. Aretæus, of Cappadocia, about the first century A.D., opened abscesses of the liver and used the trephine for the cure of epilepsy. Rhazes (852–932 A.D.), of Bagdad, cauterized the bites of rabid animals. Guy, of Chauliac, who practiced in Avignon in the fourteenth century. first mentions the Cæsarean operation, and described the use of weights to keep the lower limb extended in cases of fracture (now called the "American method"). Ambrose Paré tied the arteries with ligatures after amputation. In the U. S., Dr. Wm. Shippen, of Philadelphia, in 1763 first delivered lectures on anatomy and surgery, and the first medical school in America (the Univ. of Pennsylvania) was founded by Dr. Morgan in 1765. John Collins Warren, of Boston (1778–1856), wrote a treatise on tumors, and was the first to perform (October 16, 1846) an operation of importance on a patient anæsthetized by ether. Surgery was revolutionized in the nineteenth century by the introduction of anæsthetics, and the antiseptic methods adopted as a result of increased knowledge of the function of bacteria in disease. By skin grafting, large ulcerated surfaces caused by burns, etc., can now be healed, though formerly abandoned as incurable. Nerves are cut or stitched; the skull is opened to permit the arrest of bleeding, the evacuation of abscesses, and the removal of tumors the exact site of which has been determined beforehand by the rules of cerebral localization. The thorax is cut into for the relief of empyema, or even morbid conditions of the lung itself, and after evacuation of the pleural contents reaccumulation is prevented by securing free drainage; and, in cases of stab wounds, stitches have been made in the walls of the heart. Hardly any organ of the abdominal cavity but is subjected to exploration, and, in cases otherwise incurable, to complete or partial removal. See MEDICINE.

Surinam'. See GUIANA (*Dutch*).

Surmul'let. See MULLET.

Sur'rey, Henry Howard (Earl of), abt. 1516–47; English poet. He was the eldest son of Thomas Howard, third Duke of Norfolk, and passed his youth at the court of Henry VIII. In 1544 he commanded in France, and earned the rank of field marshal. After the taking of Boulogne he became its governor, and continued the war with advantage until January, 1546, when he met with a reverse, which induced the king to recall him. Surrey's comments on this action offended Henry, who imprisoned him for a short time in the Tower. December 12, 1546, Surrey with his father was again arrested on a charge of treason, for quartering the royal arms with his own. Surrey proved conclusively his right to assume the royal arms; yet he was condemned and executed about a week before the death of the king. His works consist of sonnets, amatory verses, elegies, paraphrases from the Scriptures, and translations of the second and fourth books of the Æneid. They are the earliest use of blank verse in English poetry.

Surrey, county of England, bordering N. on the Thames; area, 758 sq. m. In the N. part the soil is very fertile; in the S. it consists mostly of clay, chalk, and iron sand; in the whole W. part the land is heath. Wheat, hops, and vegetables are raised; hogs and poultry are reared. Near London are many factories. The county contains much wood, and the beauty of the scenery and the proximity to London have attracted many residents to Surrey, which is studded with mansions and villas. Pop. (1901) 519,522.

Sur'rogate, one appointed as a substitute for another, and particularly an officer appointed to act in the place of a bishop, or of a judge, in matters relating to marriages and to probate jurisdiction. In England the surrogate's principal function now is dispensing licenses to marry without banns. In some states of the U. S. the term is employed to designate the officer upon whom probate jurisdiction is conferred. It is a survival from the colonial period, during which the governor of a colony was vested with full authority and jurisdiction over matters of probate, but exercised them through local delegates or appointees. In the U. S. the courts exercising such jurisdiction bear various titles, such as probate courts, orphans' courts, parish courts, county courts, or courts of the ordinary. As a rule they are tribunals of limited jurisdiction, whose procedure and authority are prescribed by statutes. In some jurisdictions surrogates or probate courts have the power to appoint guardians for infants and imbeciles, to hear and determine disputes affecting estates before them for administration, to entertain and dispose of proceedings for the sale of real estate, and even to administer the estates of insolvent debtors. As a rule these courts do not possess a general equity jurisdiction.

Survey'ing, the art of measuring land for determining areas, locating lines, and making maps. Surveying is supposed to have originated in Egypt, where property lines were annually obliterated by the inundation of the Nile. Plane surveying is divided into land surveying to determine property lines and areas of fields; topographical surveying, which produces maps showing the undulations of the surface, the forests, swamps, and waters; hydrographic surveying, which locates rocks, shoals, and all the features of bays and rivers; mining surveying, which locates the underground passages and shafts of mines; railway surveying, which establishes the best routes and grades for railway lines; and city surveying, which deals with streets, sewers, and water supplies. Geological surveying notes the outcrops of rock formations, and lays them down on topographical maps, the field operations being usually of the nature of a rough reconnaissance. Geodetic surveying extends over areas so large that it is necessary to take into account the curvature of the earth. See Coast and Geodetic Survey; Geodesy.

The Gunter's chain of 66 ft., the engineer's chain of 100 ft., and tape lines of various lengths are used for measuring distances. By the use of the compass and transit for measuring angles, many distances can be computed from a few measured ones, and the work greatly expedited and economized. The compass determines the bearings of lines with respect to the magnetic meridian, while the transit measures angles on a graduated limb. Leveling instruments and rods are needed for determining elevations and differences of heights. In topographical work the plane table and stadia rods are used in connection with a triangulation. (See Stadia Measurement.) Instead of using a chain the distances may be approximately found by pacing, or by walking over the lines, and counting the steps.

Two methods of finding the distance *AX* across a river are shown in Fig. 1. By the first method a parallelogram, *ABCD,* is laid out, *AB* being a prolongation of *XA*; then *E* is marked on *AD* at its intersection with *CX.* The distances *AB, AE, DE* being measured, the distance *AX* is computed by multiplying together *AB* and *AE,* and dividing the product by *DE.* By the second method *XA* is produced to *B,* and a stake, *C,* placed at any convenient point; then *D* and *E* are taken on *BC* and *AC,* so that they are in line with *X.* The distances *AB, BD, DC, CE,* and *EA* being measured, the distance *AX* is equal to

$$\frac{AB \times AE \times CD}{BD \times CE - AE \times CD},$$

which will be somewhat simplified if *D* be taken in the middle of *BC.*

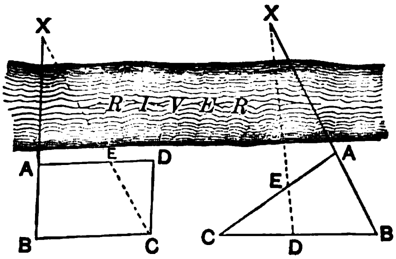


Fig. 1.

A method of finding the length of an inaccessible line, *XY,* is shown in Fig. 2. A stake is first placed at any convenient point *A,* two stakes, *B* and *C,* at points on *AX* and *AY,* and a fourth stake, *D,* so as to make *ABCD* a parallelogram. Then *E* and *F* are placed on *BD* and *CD* at their intersections with *CX* and *BY* respectively. The distances *AB, BD, DF,* and *EF* being measured, the distance *XY* is equal to

$$\frac{AB \times BD \times EF}{DE \times DF}.$$

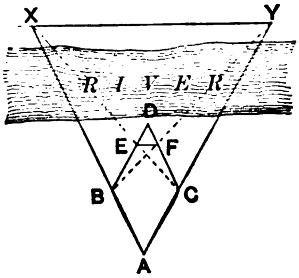


Fig. 2.

The area of a field, as *ABCDE* in Fig. 3, may be found by dividing it into triangles by either of the methods shown, measuring all the lines, and then computing the area of each triangle separately. To find the area of a triangle whose three sides are known, add the three sides together, and take half the sum; from the half sum subtract each side separately, multiply together the half sum and the three remainders, and the square root of the product will be the area.

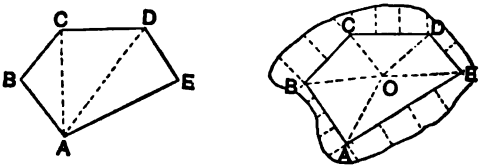


Fig. 3.

A map of an island or irregular field, as in the second diagram of Fig. 3, may be made by staking out a polygonal area *ABCDE,* and measuring either its diagonals or the distances to a central point. Then perpendicular lines, called offsets, are set off from each side to the boundary and their lengths measured, thus giving all the data for mapping and computing the area. The area of a field is determined in compass surveying by measuring the lengths and bearings of the sides. For example, for the case shown in Fig. 4, the field notes would be as follows:

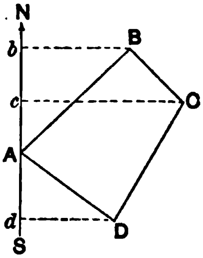


Fig. 4.

LINE.	Bearing.	Distance.
AB.....................	N. 52° E.	532 feet.
BC.....................	S. 29¾° E.	204½ feet.
CD.....................	S. 31¾° W.	389 feet.
DA.....................	N. 61° W.	362 feet.

From these data the distances *Ab*, *Ac*, *Ad*, called latitudes, and the distances *Bb*, *Cc*, *Dd*, called departures, are computed, and from these the areas included between each line and its projection on the meridian *NS*. Then the area of the field is the sum of the areas *BbcC* and *CcdD*, less the areas *BbA* and *DdA*.

On account of oscillations in the forces of magnetism and of local attractions the compass is not an accurate instrument, and should be used only for rough reconnaissance or for farm surveys, where precision is not important. In all town or city work, as also for railways and mines, the transit is employed for the direct measurement of angles.

A topographical survey of a region embracing more than a few square miles should be based on a triangulation which locates the positions in latitude and longitude of a number of stations. Then, starting from these stations, lines are run in various directions, and the location of roads, houses, streams, and other features, is made by offsets or by stadia sights. Levels are also run by which the contours or lines of equal elevations are determined, and thus a picture of the relief of the surface may be obtained. Photography is an aid in this class of work, views being taken from different points which enable the contours of the surface to be sketched in the office. In the survey of a railway, topographical work is done on each side of the line, and this is necessarily of a precise character so as to enable computations of excavation or comparative estimates of the cost of different locations.

The general features of the plan for surveying and recording the public lands that belonged to the U. S. after the Revolution, together with all ceded by individual states soon after the formation of the Constitution, and additions since made, are as follows: The entire public domain is first divided into parts called land districts, each of which is in charge of a surveyor general. In each district a meridian line is run, extending through the entire district, and from some point of this meridian an E. and W. line is run, which also extends through the district. These lines are determined astronomically, and when located serve as axes to which the subdivisions of the district are referred. Parallel to the axes, and on each side of them, other lines are run 6 m. apart, dividing the whole territory into squares, each containing 36 sq. m., called townships. To take into account the obliquity of the meridians, suitable offsets are made. The townships lying between two consecutive meridians 6 m. apart constitute a range, and the ranges are numbered from the principal meridian, both E. and W. In each range the townships are numbered both N. and S. from the principal E. and W. line. Thus if a township lies 12 m. E. of the principal meridian and 18 m. N. of the principal E. and W. line, it is called township 3 N., range 2 E. Each township is divided by meridians and E. and W. lines into squares having a mile on each side. These are called sections, and each contains approximately 640 acres. The sections of a township are numbered from the NE. corner, running along the N. tier of sections to No. 6, thence backward to section No. 12, which lies exactly S. of No. 1, and so on alternately, running from right to left and from left to right, to the SE. corner, which is No. 36. The four middle sections are numbered respectively 15, 16, 21, 22. In some of the states, section No. 16 is set apart for school purposes.

Survi'val of the Fit'test. See EVOLUTION.

Su'sa, capital of the kingdom of Elam, and afterwards one of the residences of the kings of Persia; in lat. 32° N., lon. 48° E. It was taken by Asshurbanipal (668–626 B.C.), and (Ezra iv, 9, 10) some of its people were sent to Palestine. When Alexander took the city, 331 B.C., he found great treasures of gold. Susa is the scene of several biblical narratives: (1) The vision of Daniel (viii, 2); (2) Nehemiah's office as cupbearer (i, 2; ii, 1); (3) the feast of Xerxes (Esther i, 2). One of the buildings is reverenced by the natives as the tomb of Jonah. Excavations have revealed much of its magnificence.

Susan'na, His'tory of, a short book, considered by the Roman Catholic Church to be canonical, and regarded as the thirteenth chapter of Daniel, but put among the Apocrypha in the English Bible. It relates the attempt on the virtue of Susanna, a beautiful Jewish matron, her false accusation, her rescue from death, and the overthrow of the wicked men who designed her ruin. It is probably a fiction of neo-Hebrew origin.

Suspen'sion Bridges. See BRIDGES.

Susquehan'na Riv'er, formed by the union of its E. and W. branches at Northumberland, Pa. The E. branch, the larger, rises in Otsego Lake, N. Y., at an elevation of 1,300 ft. The W. branch rises in Cambria Co., Pa., and has a very tortuous and generally eastward course through a region abounding in timber and coal, but less celebrated for its fertility and beauty than the valley of the E. branch, a portion of which, the Wyoming valley, is renowned in history as well as for its mineral wealth. The main Susquehanna flows through a wide, open, fertile, and picturesque country of Devonian slates and limestones. It reaches the head of Chesapeake Bay at Port Deposit, Md. It is a wide and stately stream, but is shallow, and is nowhere navigable to any extent, save in the spring, when the freshets bring down rafts of logs and lumber and some loaded boats. Length, main stream, 150 m.; W. branch, 200 m.; E. (or N.) branch, 250 m. The branches afford great water power. Canals have been built along the river, but have been rendered useless to a great extent by railways.

Sus'sex, county of England; S. of Surrey and bordering on the English Channel; area, 1,458 sq. m.; comprises the two modern administrative divisions of E. and W. Sussex. It is intersected from E. to W. by a range of low hills, called the S. Downs, of chalk covered with fine turf and affording pasturage, where the Southdown sheep are reared. To the N. of the range are extensive woods; to the S. the ground is wholly under tillage, and large crops of wheat, barley, beans, turnips, and hops are raised, and hogs, fowls, and rabbits are reared. Pop. (1901) 413,209.

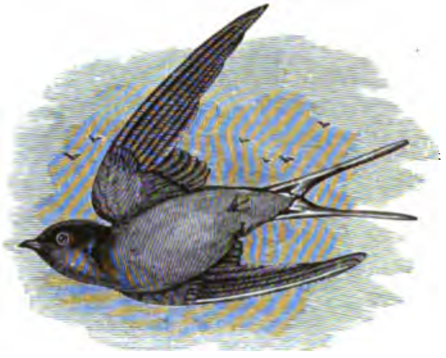
Sut'tee, the voluntary burning of a widow on the funeral pile of her husband, a practice formerly prevalent among Hindus in India. In the event of the husband dying in a distant land, the widow would place his sandals on her breast and cast herself alive into a fire. Between 1815 and 1826 more than 7,000 cases were reported in the province of Bengal alone. In 1829 suttee was suppressed.

Suvaroff, or **Suwarow** (sô-vä̆'rŏf), **Alexei Vasilievitch** (Count and Prince Italiski), 1729–1800; Russian military officer. After various distinguished services, he became general in chief in 1783. In 1787–89 he won fresh laurels against the Turks, whose main army he routed on the Rimnik, receiving the title of count. After repeated repulses he stormed Ismail in 1790, losing 20,000 men, and massacring the Turkish garrison of 30,000. In 1794, after defeating Kosciuszko jointly with Fersen, he carried Praga, a suburb of Warsaw, by assault, deluging it with blood, and was made field marshal. In 1799 he was placed at the head of the united Austrian and Russian armies in Italy, achieved many victories over the French, at Cassano, on the Trebbia, and at Novi, and received the title of Prince Italiski. He crossed the Alps to join Korsakoff, when Masséna's decisive victory over the latter at Zurich (September 25, 1799) entirely changed the situation, and he was recalled with the rank of generalissimo.

Sve'aborg. See SWEABORG.

Swa'bia, or **Suabia,** former territory of SW. Germany, corresponding nearly to the present Würtemberg and Baden. Its original name was *Alemannia*, but when, in 496, the Alemanni were conquered by Clovis, the country received the name of Swabia after the Suevi. In 1080 the Emperor Henry IV made it a duchy, and bestowed it on Frederick of Hohenstaufen. Under this family Swabia prospered, and became the seat of a flourishing civilization; but when the family became extinct with Conradin, who, as the head of the Ghibelline party, was executed at Naples in 1268, Swabia was broken up into many small dominions and free cities. From 1563 to 1806 Swabia was one of the ten circles into which the German Empire was divided.

Swal'low, any bird of the *Hirundinidæ*, distinguished by the wide, deep gape, allusion to which is evidently conveyed in the name. They have the neck rather short, the head full, the bill short, but comparatively broad and depressed; the gape very deep, and continued backward nearly as far as, or quite under, the eyes. The wings are long and pointed, the tail is forked, and normally consists of twelve feathers; the legs are weak and small, the claws curved and acute, but slender. There are over 125 species, and representatives are found in almost every land and zone. The species are among the most active and graceful of birds, and their circling and sweeping flight is well known. They feed almost exclusively on insects, which they take on the wing. The most common N. American species are the purple martin, the cliff swallow, the barn swallow, and the bank swallow or sand martin. The so-called chimney swallow is a swift. See SWIFT; MARTIN.



BARN SWALLOW.

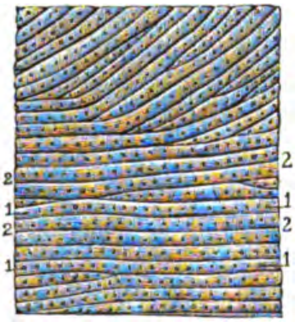
Swan, any one of those swimming birds of the *Anatidæ*, subfamily *Cygninæ*, which have a bill nearly equally broad throughout and as long as the head; the cere soft and extending to the eye; neck long and slender, consisting of twenty-two to twenty-six vertebræ; the front toes with a large web, the hind toe without a lobe, the tail short and rounded, the second and third wing quills the longest. They are among the largest of birds. Omitting the Coscoroba swan, which probably belongs with the ducks, there are nine species, all but two inhabitants of the N. hemisphere. The exceptions are the black-necked swan of Chili and the black swan of Australia. The N. American swans, whistling swan and trumpeter swan, are fine birds, both white. The tame swans are of two European species—red-billed swan (*Cygnus olor*) and Polish swan (*C. immutabilis*). The former is found in a wild state in Europe, while comparatively little is known of the second species. *C. immutabilis* is so named from the fact that the young—or cygnets—are white, while those of other species are gray. Though once held in esteem for the table, domestic swans are now bred merely for ornament.

Swan'sea, seaport in Glamorganshire, S. Wales; at the mouth of the Tawe; 216 m. W. of London. Owing to the rich coal fields in the vicinity, and its position on the bay affording safe anchorage, Swansea has developed into one of the most important manufacturing towns in Great Britain. Nearly half the entire exports are tin plates, the rest being coal, coke, iron, steel, zinc, copper, alkali, etc. Pop. of municipal borough (1901) 94,505.

Swa'ziland. See TRANSVAAL.

Sweaborg, or **Sveaborg** (svā'ä-bôrg), a fortress of Russia, on the N. coast of the Gulf of Finland. The place was originally fortified by Sweden. When Finland became a province of Russia (1809), the latter made it a military and naval depot. The isle of Vargoe is the central or principal fortress; the isle of Great Oester-Svartoe the principal naval depot and dockyard. Pop. (1906) with Helsingfors, 124,637. See HELSINGFORS.

Sweat, or **Perspira'tion,** the fluid exuded through the pores of the skin. The amount of water excreted from the skin is but little less than the volume of the urine. It varies with the seasons and climate, sweat being most profuse in summer. The action of the skin is complementary to that of the kidneys; chilling of the skin sends more blood to the kidneys. Experiments of closing the pores by a coating of varnish or tin foil, both in man and animals, have induced alarming depression and death. The artificial stimulation of the perspiration is a valuable channel of elimination in impaired health. Bathing, friction, and clean clothing, by favoring activity of the sweat glands and open pores, are means of preserving health. The sweat is secreted by the sweat glands, coiled tubular masses beneath the skin, with excretory tubules terminating on the surface. The tube is about $\frac{1}{270}$ in. in diameter, the coils or glands vary from $\frac{1}{125}$ to $\frac{1}{20}$ or $\frac{1}{12}$ in. in diameter. The number of sweat openings varies on different surfaces; thus the palm of the hand has 2,736 to the sq. in., the back of the hand, 1,490; sole of the foot, 2,685; top of the foot, 924; forehead, 1,258; cheek, 548. The number of sweat glands in the body is estimated at 381,248, and the aggregate length of tubules as 2½ m.



SURFACE OF THE PALM OF THE HAND. A portion of the skin about half an inch square, magnified four diameters: *1, 1, 1, 1,* openings of the sweat ducts; *2, 2, 2, 2,* grooves between the papillæ of the skin.

Sweat'ing Sys'tem, in popular usage, the practice followed in certain trades of subcontracting for a low class of work, which is done on the premises of the laborers, or the premises of the subcontractor, and often amid unsanitary surroundings and with excessive hours of labor. The term "sweating" is in this connection a term of reproach, and was first applied to tailors who took home work that their wives and children might assist them. Later they found it profitable to do all their work at home. Then they began employing others, thus becoming sweaters instead of being sweated. Sweating is an effect of the survival of domestic industry. Factory labor is not subject to it. It is common in certain trades —in Europe in tailoring, bootmaking, furriery, needlework of all kinds, nail and chain making, and dock labor; in the U. S. the practice is almost exclusively confined to tailoring and other needlework, the preparation of feathers, the making of cigars, artificial flowers, and fancy leather goods.

The tailoring trade is the employment in which sweating is chiefly practiced. The wholesale clothier supplies the cloth, which is cut and trimmed in his own workshops. The goods are then farmed out to contractors, for the most part Jews, to be made up and returned at a fixed price per garment. The contractor is generally the lessee of a small room, usually attached to his own lodgings in a tenement. Here two or three "teams" of workers are employed—a machine man, a baster, and a finisher constituting a "set." Wages are fixed on a piece basis. Where, for example, $7 is allowed for making up two dozen coats, $3 goes to the machine man, $2.50 to the baster, and $1.50 to the finisher. The laborer must frequently work sixteen or eighteen hours to earn a nominal day's pay. The sweater works with his hirelings, overseeing them, and often, doubtless, driving them to do their utmost. See FACTORY.

Swe'den, kingdom occupying the E. slope and S. end of the Scandinavian Peninsula; area, including lakes, 172,876 sq. m.; pop. (1907) est. at 5,377,713. The most of the boundary with Norway is formed by the watershed of the Kiölen Mountains, and that with Finland by the Torneå River. The coast is 4,740 m. long. The fiords are few, and the seas shallow, with gentle slope. The coast is bordered by a narrow ribbon of islets called the *skärgård,* rocky and bare on the W. coast, but green and fertile on the E. The Sound, 2½ m. wide at its narrowest part, separates Sweden from Denmark. The islands are most numerous about Stockholm. The Baltic slope of the peninsula is gentler than the Atlantic one, and in Norrland (the N. part of Sweden) it descends in a series of terraces, giving its rivers alternately gentle courses, when they expand into lakes, and rapids, or cataracts. The S. of Sweden, or Gothland, has rocky hills, and is separated from the central part, or Svealand (Sweden proper), by a broad, low land filled with lakes. The extreme S. is ancient *Skania,* and is very fertile. N. Gothland is relatively arid. Beyond Stockholm is Upland, the classic ground of Sweden. Dalecarlia, NW. of Stockholm, and on the Norwegian frontier, is a beautiful and picturesque land with gay, hardy, and independent inhabitants; here Gustavus Vasa found the support necessary to overthrow the tyrannical Christian.

The highest known mountains are Kebnekaise, or Ivanstenen (more than 7,000 ft.), and Sulitelma (6,154 ft.). Sweden is not mountainous; it descends a long and relatively gentle slope. Glaciers are numerous in the N., covering 150 sq. m. The largest are about Sarjektjokko (6,825 ft.), and between the two mountains above named, where on a surface of 460 sq. m. they cover 70 sq. m. The glaciers are reported as growing. A score of rivers descend the slopes, form lakes in their course, have a length of 150 to 250 m., and empty into the Bothnia or Baltic. The lakes occupy one twelfth of the surface. They are generally small. The largest are the Wener (2,150 sq. m., greatest depth, 295 ft.) and Lake Wetter (733 sq. m., greatest depth, 410 ft.). Lake Mälar, third in size, and penetrating Stockholm, fiordlike in form, is said to have 1,200 islands. The climate is mild for the latitude, and storms pass usually W. or S. The annual precipitation is from 10 to 40 in., and is greatest on the SW. coast. It is said that the harvests are fifteen days later than in the eighteenth century. Primitive rocks cover most of the country. The Glacial period was an important one in Sweden, and has left traces everywhere. Mining is an important industry, and the production of iron, lead, and copper is large. The chief districts are the Gellivara, within the Arctic Circle, and the Dannemora, in Upsala. Zinc and manganese are also produced, and cobalt and nickel are found.

The forests are extensive, covering two fifths of the area, and are characterized by spruces and birches to the N., pines and oaks in the center, and beeches in the S. The reindeer are nearly all domesticated, but the large pasturage they require and their tendency to diseases limit their usefulness. The bear, wolf, lynx, and glutton are disappearing, while the fox and elk appear to be increasing, and the roedeer is extending its range farther N. The swan is a common visitant of the lakes. Food fish are abundant, and include, in fresh water, the salmon (the most important), eel, pike, perch, and turbot; in salt water, the herring (the most important), flatfish, cod, mackerel, and sprats. The climate and soil are not favorable for agriculture, but this is made up by the care given to the art. Only one fifteenth of the area is cultivated. Barley and potatoes reach 68° N. lat.; rye passes N. of Haparanda, at the N. end of Bothnia; wheat, formerly cultivated only S. of Stockholm, reaches 75 m. farther N. The farms are generally small, but they give occupation to half of the population. The largest area is in oats, but the largest crop is potatoes. Horses are relatively numerous (one to every ten persons), due to the character of the roads. The stock generally is of poor native races, but the dairy industry is growing rapidly, as London is an accessible and profitable market.

The country is divided into twenty-four governments besides the city of Stockholm. The Finns number (1900) about 22,138; Lapps, 6,983. Aside from these, and a few Jews and other foreigners, the Swedish type is pure and unmixed. The Lutheran is the state church, and other religions, though tolerated, are few. Education is compulsory, schools are numerous, and the percentage of illiteracy is evanescent. Serious crimes are rare, but pauperism is increasing. The value of the annual imports is (1907) $180,588,000, chiefly textiles, colonial wares, and coal; the annual exports are valued (1907) at $140,606,000, chiefly timber, animals and their products, and ores. Germany is the chief importer, Great Britain the chief buyer. Gothenburg is the most frequented port, Stockholm next, and about 36,000 vessels visit Swedish ports annually.

Sweden's system of government is the outgrowth of centuries of history, like that of Great Britain. The king is intrusted with the executive, and is aided by a council of state of ten ministers. Taxation and legislation (the latter subject to the king's veto) are intrusted to the two elective houses of a parliament, one of 150 unpaid members holding for nine years, the other 230 paid members holding for three years. The government of the provinces is in the hands of prefects appointed by the king, but local affairs are administered by communal and municipal councils. The municipalities are limited to cities of over 25,000 inhabitants. The army was reorganized in 1901, and general personal service adopted. The navy is intended only for coast defense.

The early mythical history of Sweden is dignified and attractive, and the gods of the Northmen displayed their chief activity in Svealand. The Goths, who played so important a part in the downfall of the Roman Empire and the reconstruction of Europe, seem to have come from Gothland. Authentic history begins abt. 1000 A.D., when Olaf became a Christian. The people did not accept Christianity for one hundred and fifty years, and pagan ideas and customs lingered long after. The dissensions between Goths and Swedes were healed abt. 1300, and their amalgamation has continued since without serious interruption. The early history was terminated in 1389 by the battle of Axelwalde, when Queen Margaret of Denmark and Norway, a striking historical figure, took the Swedish king, Albert, prisoner, and the union of the three Scandinavian countries was confirmed in 1397 by the act called the Union of Calmar.

Sweden was very restive under the union, and tried repeatedly to break away, but without success, until led by Gustavus Vasa (1523). With this king began the brilliant period of history which made Sweden one of the first powers of Europe, gave her extensive lands to the S. and E., and made her at one time the leader and defender of Protestantism. During this period appeared his grandson, Gustavus Adolphus, by far the greatest of Swedish kings, and the period ended with the resignation of his daughter Christina in 1654. Then follow one hundred and fifty years of decline, during which Sweden was robbed both of her influence and her foreign possessions, until Gustavus IV (1792–1809) proved so impotent and perverse that he was dethroned, and his posterity repudiated. Charles XIII was then elected (1809–18), but was childless, and Marshal Bernadotte was invited to become crown prince. He accepted, and founded the present line, under which Sweden's progress has been steady and secure. In 1905 Norway dissolved the union, and became independent of Sweden.

Swe'denborg, Emanuel, 1688–1772; Swedish theologian; b. Stockholm. His father, Jesper Swedberg, was a bishop, and his family was ennobled in 1719, and took the name of Swedenborg. He was educated at Upsala, and then traveled through Europe. He attained eminence by his writings upon mathematics and mechanics, and later on the natural sciences and on finance. In 1716 he was made assessor of the Board of Mines by Charles XII. He assisted the king at the siege of Frederickshall in 1718 by transporting some vessels over fourteen miles of land by machines he invented.

He had always been a thoroughly religious man, but for a few years before 1745 his diaries and notebooks show that he was changing the direction of his studies from the physical and natural to the psychical and spiritual. In that year, he tells us, he "was called to a new and holy office by the Lord himself, who manifested himself to him in person, and opened his sight to a view of the spiritual world, and granted him the privilege of conversing with spirits and angels." In 1747 he resigned his office of assessor, which he had held for thirty years, requesting that half of his salary might be continued to him. The king accepted his resignation, and granted him a pension for life equal to his full salary. He wrote to a friend: "My sole view in this resignation was, that I might devote myself to that new function to which the Lord had called me. On resigning my office a higher degree of rank was offered me, but this I declined, lest it should be the occasion of inspiring me with pride."

From 1749 to 1756 he published the "Arcana Cœlestia" in eight quarto volumes; in 1758, "An Account of the Last Judgment and the Destruction of Babylon," "On the White Horse Mentioned in the Revelation," "Heaven and Hell," "On the Planets in our Solar System and in the Starry Heavens," and "On the New Jerusalem and its Heavenly Doctrines"; in 1763, "The Doctrines of the New Jerusalem Concerning our Lord," same "Concerning the Sacred Scriptures," same "Concerning Faith," same "Concerning Life," a "Continuation Concerning the Last Judgment and the Destruction of Babylon," and "Angelic Wisdom Concerning the Divine Love and Wisdom"; in 1764, "Angelic Wisdom Concerning the Divine Providence"; in 1766, "The Apocalypse Revealed." He had written a much larger work, "The Apocalypse Explained," as far as the tenth verse of the nineteenth chapter, which he did not publish, nor, as far as is known, finish —it has been published since his death; in 1768, "The Delights of Wisdom Concerning Conjugial Love"; in 1769, "A Brief Exposition of the Doctrine of the New Church," and a small work entitled "The Intercourse between the Soul and the Body" (in the English translation, "A Treatise on Influx"). In 1771 he published his last work, "The True Christian Religion, Containing the Universal Theology of the New Church." He also left voluminous manuscripts.

After the publication of the "True Christian Religion" he went to London, and while there he was struck with hemiplegia. After a few weeks he recovered his speech, and his faculties were clear to the last. He has never been charged with imposture, and they who think he was insane must rest that opinion on the fact that for more than twenty-five years, with brief intermissions, he claimed that he was in the spiritual world whenever he wished to be there, and published what would fill volumes of things there seen and heard.

Swe'dish Green. See SCHEELE'S GREEN.

Swedish Lan'guage, genetically, a member of the Scandinavian division of the Teutonic group of languages. With Danish it forms the minor group E. Norse, as distinguished from W. Norse, made up of Icelandic and the popular dialects of Norway. Its present territory is Sweden, with parts of Russian Finland and Esthonia. Chronologically, two main periods are recognized in the history of the language, *viz.*, Old Swedish, from the end of the Viking age to the Reformation (1050–1540), and Modern Swedish, from the Reformation to the present time.

Sweet Bay. See BAY.

Sweet'bread, the pancreas, or thymus gland of an animal, used as food. The former is usually called stomach sweetbread and the latter throat sweetbread.

Sweet'brier. See EGLANTINE.

Sweet Flag. See ACORUS CALAMUS.

Sweet'sop, the soft, sweet, and aromatic fruit of a small tree, the *Anona squamosa* of tropical America, cultivated not only in Brazil and the W. Indies, but also in Hindustan and the E. Indies. The fruit is greenish and resembles an artichoke in size, in form, and in its scaly covering. The pulp is soft, somewhat mealy, sweet, and luscious, though with a musky, aromatic odor and flavor. It is extensively used as an article of food, and it has proved the staff of life to the people of Hindustan in seasons of famine. In India it is called custard apple, though the true custard apple is *A. reticulata.*

Sweyn (swān), **Swegen** (svā'gĕn), or **Svend,** King of Denmark and father of Canute the Great; invaded England to avenge the massacre of the Danes in 1002, and ravaged the country. In 1013 he made another invasion, and this time reduced the Anglo-Saxon Kingdom. He proclaimed himself king, but died (1014) before he had established his power, leaving Canute as his successor.

Swift, Jonathan, 1667–1745; British author; b. in Dublin, of purely English descent; graduated Trinity College, Dublin, in 1685, and remained till the Revolution of 1688–89 drove him to England, where he became private secretary to Sir William Temple. In 1692 he took his master's degree at Oxford, and two years later went to Ireland. In 1694 he was ordained, and soon after received the prebend of Kilroot, in the diocese of Connor, but soon returned to his secretaryship. He next became chaplain to Lord Berkeley, a lord justice of Ireland, whom in 1699 he accompanied to Dublin. Having received several livings, he assumed the duties of his vicarage at Laracor in 1700, and shortly after received the prebend of Dunlavin in St. Patrick's Cathedral, Dublin. In 1701 he published his "Discourse on the Contests and Dissensions between the Nobles and Commons of Athens and Rome," vindicating the conduct of the Whig leaders. In 1704 appeared his "Battle of the Books," which was succeeded by the "Tale of a Tub," a satire upon the Catholics and dissenters.

In 1708 he published his "Argument to Prove the Inconvenience of Abolishing Christianity," "Sentiments of a Church of England Man with Respect to Religion and Government," "Predictions for 1708, by Isaac Bickerstaff," and "Letters on the Sacramental Test"; and, in 1709, "A Project for the Advancement of Religion and the Reformation of Manners," the only work to which he ever attached his name. Failing to receive preferment from the Whigs, he went over to the Tories in 1710. His powerful pamphlet on the "Conduct of the Allies" (1711) raised his reputation to the highest pitch; but Queen Anne, under the advice of Archbishop Sharp and others, refused him any high preferment. In 1713 he was appointed to the deanery of St. Patrick's Cathedral, Dublin, the income of which amounted to £700. About this time he wrote his "Public Spirit of the Whigs," and in 1714 appeared his "Free Thoughts on the State of Public Affairs." The death of the queen and the overthrow of the Tories sent Swift back to Ireland, where he remained during the next twelve years. Swift's history was painfully involved with that of three young ladies: Miss Jane Waring, whom he called Varina; Miss Esther Johnson, named Stella in his poems; and Miss Hester Vanhomrigh, named by him Vanessa. Under the stipulation of perpetual secrecy he married Stella privately in 1716. Their relations had been and continued to be equivocal, and she died without any public recognition of her marriage.

Swift produced in 1720 "A Defense of English Commodities, being an Answer to the Proposal for the Universal Use of Irish Manufactures," followed in 1724 by the celebrated "Drapier's Letters," in which he attacked the scheme to allow William Wood to supply Ireland with a copper coinage. In 1726 appeared his "Gulliver's Travels," a series of satires on human nature and society, the most original and extraordinary of all his productions. It has been conjectured with probability that the voyage to the Country of the Houyhnhnms was written during the last illness of Stella, and that the mental anguish of the author gave ferocity to this appalling satire. By 1736 his health became so undermined as to preclude literary labors. In 1740 his memory almost left him, and frequent fits of passion terminated in furious lunacy. This subsided in 1742, and he passed the last three years of his life in speechless torpor. Some posthumous works of Swift were published long after his death, including "A History of the Four Last Years of Queen Anne," "Polite Conversation" (a satire), and "Directions for Servants." Innumerable anecdotes preserve the tradition of his wild humor, his tumultuous bursts of arrogance, his admirable perspicuity, and his curious inconsistencies of conduct and temper. His person was athletic and commanding, his eyes of the clearest blue, and all his life he was endeavoring by violent exercise to subdue his mysterious physical maladies, probably due to labyrinthine vertigo. History has dwelt to excess on his ferocity, and has said too little about his prevailing charm of address and his occasional but exquisite outbursts of sympathy.

Swift, common name for the birds of the *Micropodidæ* (or *Cypselidæ*), probably first bestowed on the European species from its rapid flight. In external appearance the swifts much resemble the swallows, but the bill is decidedly smaller; the tail is variable in shape, deeply forked in some, almost square in others, but always composed of ten feathers. The first toe is directed more or less forward, and in the typical swifts (*Cypselinæ*) the second, third, and fourth digits have but three joints each. Anatomically the swifts are very different from the swallows, and do not belong to the same order. There are about fifty species distributed over the greater portion of the globe; with the exception of the E. Indian tree swifts (*Macropteryx*), which are prettily clad, they are mostly of somber plumage. They are insect eaters and pass the greater portion of their time on the wing, and some, like the chimney swift or chimney swallow (*Chætura pelagica*) of the U. S., even gather the materials for their nests in full flight. They build in caves, crevices of the rock, nooks of old buildings, hollow trees, or adapt themselves to civilization in chimneys, while an African swift suspends its nest to a palm. The nests are gummed together with saliva, and the famous edible birds' nests, built by the little swifts of the genus *Callocalia*, consist entirely of a peculiar salivary secretion. The common species of Europe (*Micropus apus*) ranges from Great Britain to India, occurring also in N. Africa. In the W. of the U. S. the name swift is applied to a small fox (*Vulpes velox*), and in the S. to a small lizard (*Sceloporus undulatus*).

ESCULENT SWIFT (*Callocalia esculenta*).

Swift Shrike. See WOOD SWALLOW.

Swim Blad'der. See AIR BLADDER.

Swim'ming, the act of progressing in the water by means of strokes with the hands and feet. As the specific gravity of the human body is only slightly greater than that of water, swimming is easily learned, with or without an instructor. The density of salt water being greater than that of fresh, it is much easier to swim in it. Indeed, if the saturation is very great, as in the Dead Sea or the Great Salt Lake, the specific gravity is greater than that of the human body, and a man cannot sink in it.

A variety of devices have been in use both to assist in acquiring the art and for making swimming easier or more rapid; but the presence in the water of a competent instructor to give the necessary support will give better results to the beginner than any supports which buoy the body too high in the water, and teach the swimmer to depend on something other than his own floatage. Let the learner wade out until breast deep in the water, turn toward the shore, and throw a white pebble or any other object easily discernible a short distance before him and plunge after it. The resistance offered by the water will buoy him up, and the moment he has acquired confidence and command of his limbs to strike out regularly he has learned to swim. The common strokes are the broad, dog paddle, and side, or Indian. In the broad stroke, after bringing the body nearly horizontal, the arms and legs are drawn slowly toward the body and then extended, alternately, with a quick and strong impulse. The hands should be kept flat and the fingers closed, the legs should be well apart at the beginning, and at the conclusion of the act of kicking brought together. In the tread the body is kept perpendicular and the hands and feet beat downward. In the dog paddle the body lies nearer horizontal, and hands and feet are moved rapidly and alternately with a paddling movement. The side stroke is commonly used in racing, and consists, briefly, in turning the body on one side and reaching far ahead with the under hand while the other sweeps by the chest and belly.

Swin'burne, Algernon Charles, 1837-1909; English poet; b. London; received his education partly at Eton, partly in France, and in 1857 entered Balliol College, Oxford, where he remained only a short time. His life was mainly spent in London. He published, among other works, "Rosamond" and "The Queen Mother," dramas (1861); "Atalanta in Calydon," a tragedy constructed after the Greek model, in which he first manifested his peculiar mastery of rhythm of the English language (1864); "Chastelard" (1865); "Poems and Ballads," which were so severely criticised for their erotic character that the English publisher endeavored to suppress them, and which were put forth in New York under the title "Laus Veneris" (1866); "A Song of Italy," "Ode on the Proclamation of the French Republic," "Songs Before Sunrise," "Bothwell," a dramatic sequel to "Chastelard"; "Essays and Studies," "Studies in Song," "A Century of Roundels," "Life of Victor Hugo" (1886), "Locrine" (1887), "The Sisters" (1892), "Rosamond," "Love's Cross Currents," a novel (1905). After the death of Tennyson, Swinburne was the preëminent poet of England.

Swine, any artiodactyl mammal of the *Suidæ*. The wild boar (*Sus scrofa*) of Europe, N. Africa, and Asia Minor is generally regarded as the original of the domestic forms. The river hogs, the babiroussa, and the wart hogs are other swine. The chief seat of the world's swine-rearing industry is in the N. states of the Mississippi valley, where favoring conditions of soil and climate encourage the production of Indian corn, which is chiefly relied on to feed the swine.

In the U. S., swine, when very young, are designated as pigs, when partly grown as shotes, and later as hogs. Nine tenths of the hogs in the U. S. are black, with small markings of white on the face, feet, and tail, and sometimes elsewhere. These are of the Poland-China and Berkshire breed, or a mixture of the two; the next most prominent breed is the Chester White. Other breeds, equally distinct, are the Essex, black; Duroc-Jersey or Jersey, red, sandy, or reddish; Victoria and Suffolk or Small Yorkshire, white. The Essex and Yorkshires are from England, the Duroc-Jerseys are of uncertain origin, and the Victorias originated since 1860 in Indiana. The predominant breed, the Poland-China, originated by crossing in Butler and Warren Cos., Ohio, between 1838 and 1840. These were crossed with imported Berkshires to give refinement and propensity to earlier fattening, and incidentally they acquired the Berkshire's black color and white markings. The Berkshire in its improved form originated (as did the Essex) in England—Italian and Spanish swine being crossed with the coarser native stock—between 1780 and 1800, but although first introduced into N. America about 1830, it did not obtain general favor until 1870-80. Hogs of a dark color are most largely reared because of a belief that they are hardier and less susceptible to affections of the skin incident to sudden changes of temperature and the muddy quarters, severe winds, and burning suns to which they are subjected. Poland-Chinas, Berkshires, Chester Whites, and Duroc-Jerseys are large breeds, weighing from 300 to 450 lb. at twelve months and from 500 to 600 and even more at eighteen months, and they have been bred to a degree of fineness in bone, smallness of offal, compactness of form, and early maturity which makes them well-nigh perfect.

The two principal markets, slaughtering and packing points, for swine are Chicago, Ill., and Kansas City, Kan. There were marketed in the former city in 1894 7,483,228 head, and in the latter 2,547,077. Chicago packed in the year ending March 1, 1895, 5,293,202, and Kansas City 2,105,333; these numbers have been largely exceeded in previous and succeeding years, but are a fair average. Next to cotton and wheat the swine interests furnish the largest values in exports from the U. S.; value of swine in the U. S. (1910) $436,603,000.

The chief scourge among swine is a contagious fever, popularly called cholera, which destroys entire herds. Faulty sanitary and hygienic surroundings and insufficient variety of food, tending to an enfeebled constitution, encourage its development. It is fatal in from one to six days, or ends in a tedious or unsatisfactory recovery.

Swiss Guards, bodies of mercenary Swiss troops employed as guards about courts. Swiss mercenaries have frequently been hired by foreign powers since the time of the Swiss struggle for independence, which brought the valor and hardihood of that people into notice. The term Swiss Guards, however, especially refers to the royal bodyguard of the kings of France. This force, which was organized in 1616, showed remarkable courage and loyalty in the service of the Bourbons. In 1789 they were roughly handled by a mob, and August 10, 1792, almost every man was killed in the heroic defense of the Tuileries. They numbered about 2,000. Their heroism is commemorated by Thorwaldsen's "Lion of Lucerne," carved from the living rock in a cliff near one of the gates of Lucerne. Louis XVIII reorganized the Swiss Guard in 1815. In the Revolution of 1830 they were defeated and dispersed.

Swith'in, Swithun, or Swithum, Saint, d. 862; bishop and patron of Winchester; became a monk in the Old Monastery in Winchester; later provost; private chaplain to Egbert, King of the W. Saxons; his adviser and tutor to the King's son Ethelwolf, and later his adviser also; Bishop of Winchester, 852. He was remarkable for piety and activity in building churches. In 971, when his relics were transferred to the church, "such a number of miraculous cures of all kinds were wrought as was never in the memory of man known to have been in any other place." His day in the Roman calendar is July 2d—his death day—but in the English calendar July 15th; and it is commonly said in England that if it rains on St. Swithin's Day it will rain for forty days thereafter, a saying which is supposed to have originated in the alleged fact that the translation of Swithin's remains was delayed by heavy rains.

Swit'zerland, formerly also called Helvetic Confederation, a federal republic of Europe, bounded N. by Germany, E. by Austria, S. by Italy and France, and W. by France; area, 15,976 sq. m.; pop. (1905) est. at 3,463,609. It is the most mountainous region of Europe, and, with Tyrol and Savoy, the most elevated, though the Caucasus rises higher in single peaks. It is covered throughout almost its whole extent by the Alps, of which the following groups, with their various branches, belong properly to Switzerland: The Pennine Alps, the Lepontine or Helvetian Alps, including the divergent Bernese Alps; the Rhætian Alps. The principal summits, ranging between 15,200 and 13,700 ft., are treated separately. To the W. of the Alps, between France and Switzerland, extends the Jura Range. Of the heights commanding the most striking panoramas, the Rigi, though comparatively low, is probably the finest. In the valleys of the Bernese Oberland, and those which descend from Monte Rosa in Valais, the glaciers are seen to great advantage. The ravine of the Via Mala, on the upper Rhine in Grisons, presents one of the most sublime scenes. The glaciers are the reservoirs which feed some of the largest rivers of W. Europe, including the upper Rhine, which flows within and along the boundary line of Switzerland, and then enters Germany, and the Rhone, which rises among the glaciers of the S. Gothard range. The next largest river, the Aar, carries the waters of fourteen cantons to the Rhine. There are numerous waterfalls, the most celebrated being those of the Rhine, 3 m. below Schaffhausen, 60 to 75 ft. high.

The principal lakes are those of Constance, Geneva, Lucerne, Zurich, etc. Geologically, the country is wonderfully interesting, but the mineral resources, including iron, lead, and copper, are small. The salt mines near Basel and those at Bex (Vaud) are the most important. The mineral springs and watering places include Leuk (Valais), St. Moritz, in the valley of Engadine (Grisons); Pfäfers (St. Gall), and Baden and Schinznach (Aargau). On the highest summits snow and ice are perpetual; yet in Valais the fig and grape ripen at the foot of ice-clad mountains. The climate is subject to great variations, but on the whole is very healthful. About two thirds of the surface consists of lakes and other waters, glaciers, naked rocks, and uninhabitable heights. Some districts are very fruitful, yet the grain raised is inadequate for home consumption. The vine is cultivated on the slopes of the Jura and in the valleys of the Rhine, Rhone, Reuss, Limmat, and Thur, and in some places ripens at 2,000 ft. above the sea. Flax and hemp are extensively grown. The forests cover about seventeen per cent of the soil, and, although imperfectly cultivated, the production of timber exceeds the home consumption.

Fishing is extensive, but hunting has fallen off, and in some of the cantons is prohibited. Chamois are still found in the Alps; other animals are bears, wolves, wild boars, and roebucks; foxes and hares abound, and otters are found in some of the lakes. Switzerland is celebrated for rich and excellent pastures; the finest breeds of cattle are those of the Simmenthal and Saanen (Bern), Gruyère (Fribourg), Zug, and Schwytz. The best cheese is made in Gruyère and in Urseren (Uri), and in the valleys of the Emmen, Saane, and Simmen. The chief seats of the cotton manufacture are in Aargau, Appenzell, St. Gall, Zug, and Zurich; of silks, in Basel and Zurich; and of watches, in Bern, Geneva, Neuchâtel, Solothurn, and Vaud. Switzerland consists of twenty-two cantons.

There are no villages beyond 5,000 ft., except the hamlet of Juf, at 7,000 ft., the highest in Europe. On the Great St. Bernard the hospice is at 8,110 ft. The inhabitants of the high valleys have larger bodies and feet than those below, and are more free from several maladies, notably phthisis. Pneumonia and pleurisy are more common and more dangerous than below, as are also asthma, scrofula, and rheumatism. In the deep, moist valleys, with little sunshine, goiter and cretinism occur, but increasing attention to cleanliness and general comfort diminishes this.

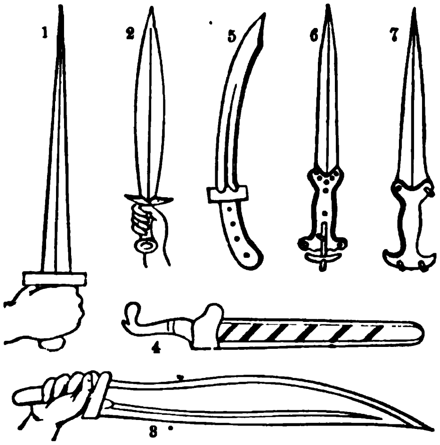
German is spoken by the majority, and is the official language in sixteen cantons, French in five, and Italian in one. Education is compulsory, primary education is free, and the percentage of illiteracy nearly evanescent. There are about 6,000 schools of all grades and 6 universities. The principal towns, with the population for 1908, are: Zurich (186,999), Basel, Basle, or Bâle (129,470), Geneva (118,256), Bern (74,651), Lausanne (55,741), St. Gallen (54,127), Chaux-de-Fonds (42,188), Lucerne or Luzerne (35,433), and Neuchâtel (23,395). The imports for 1908 were valued at $326,851,833 and the exports at $211,960,203. The chief imports were foodstuffs, tobacco and spirits, silk, wools, cottons, and other textiles; metals, minerals, and chemical colors, bullions, and coin. The chief exports were textiles, timepieces, and colors. Wheat and flour are largely imported. The trade is chiefly with Switzerland's immediate neighbors—Germany first—but many exports go to France, Italy, Great Britain, and the U. S.

The constitution is thoroughly federal, with some novel features. Supreme legislative and executive authority in federal matters rests in a federal assembly of two houses: a state council of forty-four members, elected by the cantons, and a national council composed of 147 members—one for each 20,000 population, elected every three years by direct ballot. Executive authority is deputed to a federal council of seven, elected by the assembly for three years, and its president and vice president are the chief magistrates of the nation. There is a special tribunal for trial of cases between the confederation and cantons, or between cantons. The confederation can levy no direct taxes, and its chief source of revenue is the customs. The revenue for 1908 was $22,511,654 and the expenditures $22,017,315. No standing army may be maintained within the confederation, but the militia consists of 500,000 available men. Each element of the confederation is sovereign and independent in local affairs and in such others as are not limited by the federal constitution. The cantonal governments agree only in the absolute popular sovereignty, and differ much in organization and details. The referendum is most fully developed in Zurich, where all laws, and even the chief matters of finance, must be submitted to the popular vote. Communal government is well developed for local affairs. Several cantons have only indirect taxation—duties, stamps, etc.—while others tax income and property also.

Though many traces of the ancient race known as lake dwellers remain in Switzerland, the Helvetii were the first inhabitants whose name has been transmitted to us. They were continually involved in war with Gauls, Germans, or Romans, and even dared to attack Cæsar's army, but were beaten back to their native valleys, and from this time to the Teutonic invasions they served as a bulwark for Rome against the Germans, and their country became a Roman province. The time came, however, when the Romans had to withdraw their forces and make room for other invaders—the Ostrogoths, the Alemanni, the Burgundians, and the Franks. The W. part was included in the Burgundian Kingdom. In 1032 Switzerland came under the rule of the emperors. At the beginning of the twelfth century the emperor granted to the dukes of Zähringen, as vassals, the greater part of W. Switzerland and Lesser Burgundy. At the death of the last Zähringen (1218) Switzerland was again under the emperor, who, however, conferred several parts on other vassals. The Swiss were willing to submit to the emperors, but bore uneasily the rule of vassals. Following the example of the leagues of the nobles and of the free cities, the three forest cantons—Uri, Schwytz, and Unterwalden—formed in 1291 a league, known as the Old League of High Germany, which was the nucleus of the present confederation.

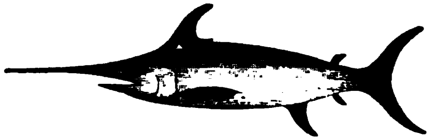
The house of Hapsburg attempted to increase its rights and domains; the Lands (or forest cantons) opposed, and tried to free themselves from the dominion of the Hapsburgs. The Swiss war of independence is memorable for the bravery and vigor of the league. At Morgarten Pass (1315) Duke Leopold was utterly defeated, and for seventy years no serious attempt was made by the dukes of Austria to force their rule upon the Swiss. In 1386 the Swiss gained another victory over the Austrians at Sempach, and this, followed by another victory at Näfels (1388), placed the league on a firm footing. New districts were added, and in 1474 their independence of the house of Hapsburg was formally recognized. In the fifteenth century another powerful foe appeared in the person of Charles the Bold of Burgundy, but the Swiss won victories at Grandson and Morat in 1476 and in 1477 under the walls of Nancy, where Charles was slain. By 1513 the number of the cantons was increased to thirteen. In the next few years Protestantism spread rapidly throughout the country, under the impulse of Zwingli, and in 1531 war broke out between the Protestant and Roman Catholic cantons. The Protestant canton of Zurich was defeated by the forest cantons at Kappel, and Zwingli was killed. Geneva became the seat of Calvinism, and the Pays du Vaud, long subject to Savoy, was conquered in 1536 by the Protestant canton of Bern.

During the Thirty Years' War Switzerland remained neutral, and by the Treaty of Westphalia (1648) her independence of the German Empire was recognized. Up to the death of Louis XIV disorder existed in Switzerland, and this disturbed condition continued until the French Revolution, the principles of which gained ground easily in Switzerland. The number of malcontents increased, and the Swiss were to be seen in opposing armies. The canton of Bern fought valiantly to the last against the new ideas and the foreign republican armies, but without success. Switzerland was to be converted into a republic "one and indivisible," according to the views of the French Directory. This was known as the Helvetic Republic, and lasted four years. To that form of government succeeded a league, based upon federation. Under this constitution Switzerland recovered an appearance of peace, but the mediator of that "mediation act" (February 13, 1803) was a meddlesome neighbor and a despotic ruler. The mediation lasted ten years, and came to an end at the fall of the French Empire. The European reaction against France took place, and Switzerland had to participate in it; her soil was invaded by the allies, as it had been by the French armies. By the Congress of Vienna (1815) her independence and neutrality were acknowledged and guaranteed. In 1848 a new constitution was adopted without foreign interference; this gave place in 1874 to that now in force.



1. Greek Sword, from a monument. 2. Greek sword in the Royal Antiquarium, Berlin 3. Lacedæmonian sword, from a vase. 4. Greek sword in scabbard, from a vase. 5. Barbarian sword, from the Column of Antonius. 6 and 7. Roman swords, in the Museo Nazionale, Naples.

Sword (sōrd), a weapon consisting of a long blade, and a handle, or hilt, for grasping, the blade being larger than the dagger. The saber has one edge only and a broad back; some cavalry sabers are straight. The Japanese two-handed sabers, worn as the badge of the Samurai or warrior class, are of great excellence. The scimiter of Mohammedan nations is a light saber with a blade much curved backward; they were made of the famous Damascus steel, wrought so that its surface is covered with delicate waving lines in its substance. The yataghan of the Mohammedans has a sharp concave edge. The cutlass is a short saber, cheaply mounted. The ancient Roman infantry used a straight, double-edged, sharp-pointed blade about 20 to 24 in. long. The Malayan creese is about 18 in. long with a decidedly waved edge on each side. In the early Middle Ages the swords of the knights were broad bladed and straight; in the thirteenth century the blades were sometimes 45 in. long, and the two-handed swords were even longer. It was not an age for delicate sword play. The rapier was introduced by the Spaniards (the blades of Toledo being famous), and adopted by men of family, about the close of the sixteenth century, but the private soldier still used a blade for cutting as well as thrusting, and this passed into the heavy broadsword of the seventeenth century, famous in the hands of Cromwell's cuirassiers. A similar weapon used by the Scotch is sometimes called a claymore, but the claymore proper was a huge two-handed sword. In modern armies the sword is worn by officers generally, though in the S. African War it was found to be too distinctive a mark for sharpshooters. In a ceremonial way the city sword or walking sword of the eighteenth century was the badge of a gentleman, and even to-day a slender sword forms part of the costume of a European courtier or diplomatist.



Common Swordfish.

Sword'fish, any fish of the *Xiphiidæ*, remarkable for having the upper jaw prolonged forward in a bony sword. The common swordfish (*Xiphias gladius*) ranges from the Atlantic coast of N. America eastward to the Mediterranean. It is often 10 to 16 ft. long. It is a rapid swimmer, and is said to assail the largest whales with its sword. It sometimes strikes ships with such force as to penetrate several thicknesses of plank, and the sword is frequently broken off and left *in situ*, but the fish which most often assaults vessels is a smaller species of the genus *Tetrapturus*. The swordfish is generally esteemed as food, and is taken by the harpoon, an exciting and dangerous sport, but is too scarce to be of commercial value. The use of the sword is not clearly ascertained. The food of the swordfish consists of cuttlefish, especially the squid, and of small fishes.

Syb'aris, city of Magna Græcia, in Lucania; founded abt. 720 B.C.; 3 m. from the Tarentine Gulf, between the rivers Crathis and Sybaris, the modern Crati and Coscile. It rose rapidly to a great prosperity, founded other colonies—Posidonia, Laüs, and Scidrus—covered a space of 6 m. in circumference, and was notorious for the luxury and effeminacy of its inhabitants. In 510 B.C. Sybaris was completely destroyed by the Crotonians and never recovered, but in 443 B.C. the descendants of the conquered and exiled Sybarites founded the city of Thurii near the old site of Sybaris.

Syc'amore, a tree (*Ficus sycomorus*, or *Sycomorus antiquorum*) which is a near relative of the fig. It is a widespreading, shady tree, much planted in the Levant for its shade. Its light, fragile wood is reputed to be indestructible. Its fruit is inferior in quality to the fig, but is abundant and palatable. In the U. S. the buttonwood or plane tree is improperly called sycamore, and in Great Britain that name is applied to a maple (*Acer pseudoplatanus*).

Syd'enham, Thomas, 1624–89; English physician; b. Winford Eagle, Dorset; educated at Oxford, and in 1648 became a fellow of All Souls' College; served as an officer in the parliamentarian army; studied medicine at the college of Montpellier, France; took his degree of M.D. at Cambridge, and established himself abt. 1660 as a physician in London, where he soon attained the foremost place. He abandoned the routine practice then prevalent, basing his own upon the theory that there is in nature a recuperative power which it is the province of the physician to aid. He was especially acute in observing and describing the symptoms of diseases. Among the services which he rendered were the treatment of malaria by cinchona and the administration of cooling remedies in smallpox. His works, which are not numerous, were written in Latin, but have been frequently translated. In 1843 was founded the Sydenham Society, for the purpose of printing important medical works in English and other languages. Its first issue was the complete works of Sydenham.

Syd'ney, capital of New S. Wales, Australia, and the oldest city of Australasia; on the S. side of Port Jackson, in lat. 33° 52′ S., lon. 151° 12′ E. The climate is temperate and generally healthful. Port Jackson is a long, slender inlet, forming a magnificent landlocked harbor.

The city proper is about 4 m. from the heads, on a peninsula between Rushcutter Bay on the E. and Blackwattle Bay on the W. It has a water front of 8 m. The surface is undulating. The streets are often crooked and steep, but this gives the city an old-fashioned appearance unique in Australia, and affords frequent and charming vistas over the waters of the bay. There are many public parks (3,800 acres), including the Domain (130 acres), and Moore Park (500 acres), to the SE. of the city. The more fashionable of the numerous suburbs are toward the E., while the business portion is extending westward. The entire distance to Parramatta, 15 m., is practically suburban. The factories are more on the S. side, and population is rapidly extending toward Botany Bay, 6 m. to the S.

The public and many private buildings are of fine style, and generally of a fine sandstone found in the vicinity. The university is the most important edifice in Australia, the principal façade being 500 ft. in length. With regard to its degrees it has the status of the English universities. The metropolitan cathedral of St. Andrew's and the Roman Catholic Cathedral of St. Mary are two of the finest structures in Australia. The city is in the center of a large coal basin, and the beds probably pass under the city itself. Coal is cheap and abundant. The manufactures include all the products of the pastoral industry, and especially boot and shoe making, railway supplies, carriage and wagon making, glass, pottery, furniture, stoves, tobacco, etc., and distilling and brewing. The city was founded in 1788 by Capt. Philip as a penal station, and long remained a humble village. In 1861 it had 56,845 inhabitants, 93,685 with the suburbs. Pop. (1901) 488,382.

Sydney, an important seaport and manufacturing city of Nova Scotia, Canada. It is situated on an excellent harbor in the E. part of Cape Breton Island and has extensive coal mines in its vicinity. The city's manufactures include iron, steel, tar, cement, and lumber. A large fleet of ocean-going steamers is owned in the city, as well as many fishing craft. Pop. 16,000.

Sydney. See SIDNEY.

Sye'ne, ancient name of ASSOUAN (*q.v.*).

Syl'la. See SULLA.

Sylves'ter, name of two popes, besides an antipope. SYLVESTER I, SAINT (abt. 270–335), succeeded Pope Melchiades, January 31, 314, and concurred with Constantine in convening the Council of Nice. In the false decretals Constantine is said to have made to him a "donation" of Rome and its temporalities. SYLVESTER II (GERBERT) (abt. 920–1003) was a Benedictine monk and a famous instructor at the Univ. of Rheims. The Emperor Otho III made him Archbishop of Ravenna, and had him elected pope, April 2, 999. He administered the office with uncommon zeal, talent, and severity. His universal knowledge caused him to pass for a magician. SYLVESTER III, for three months the antipope of Benedict IX and Gregory VI, was deposed by the Synod of Sutri, 1046.

Syl'viculture. See FORESTRY.

Symbio'sis, a kind of commensalism or companionship, in which associated living forms are intimately connected with and dependent upon each other. Thus the plants known as lichens are composed of symbiotic associations of algæ and fungi. The association of "yellow cells" (plants) in the *Radiolaria* (animals) is an example in the animal kingdom.

Symbol'ic Log'ic, or, better, ALGORITHMIC LOGIC, a form of logic introduced by George Boole, an English mathematician, characterized by an artificial language composed of symbols with their laws of combination, and possessed of peculiar advantages in giving of actual relations representations which can be manipulated according to rules of operation and procedure, experimented upon to give new knowledge, according to organized processes.

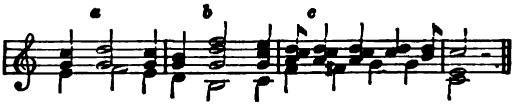
Sym'phony, or Sinfo'nia, in music, an elaborate composition designed for performance by a full orchestra, and consisting of several distinct movements (usually four), each of which has its individual character, as the *allegro, andante, adagio, minuet, scherzo,* etc., while the whole unite in forming one symmetrical work of art. There appears to have been no important difference between the symphony and the overture until about the end of the eighteenth century.

Symplegades (sĭm-plĕg'ă-dēz), two islands in the N. entrance of the Thracian Bosporus, described by the ancients as floating islands which dashed against each other, crushing whatever came between them.

Synagogue (sĭn'ă-gŏg), a Jewish church. The earlier synagogues, under the Persians, Greeks, and Romans, were also for deliberative or higher educational purposes. Despite rabbinical traditions, its beginnings probably do not go beyond the Babylonian captivity. The synagogue is generally a high building, facing the four cardinal points. The E. wall, which all must face during the recital of certain prayers, incloses the "holy ark" (*aron hak-kodesh*), in which Hebrew copies of the Pentateuch, written on vellum, are deposited; and opposite it, near the center, is the platform (*bimah*) on which the reading from the same is performed by the reciter or cantor (*'hazan*), or by a special reader (*kore*). Sermons or lectures are delivered from a smaller platform adjoining the ark, by the rabbi or lecturer.

THE GREAT SYNAGOGUE was an assemblage of 120 men which, according to Jewish tradition, Nehemiah brought together for the reorganization of religious worship and the maintaining of civil order. They are supposed to fill up the gap between the last of the prophets and the first of the rabbis. To this body are ascribed the reconstitution of public worship, the final collection of the canon of the Old Testament, and the introduction of certain prayers. Many other ordinances are referred to their initiative.

Syncopa'tion, in music, an arrangement of notes which often checks the rhythmical movement, disturbing the accent, and rendering emphatic that part of a bar or measure which would otherwise be unaccented. See *a*, *b*, and *c* in the example:



Syncopation of a simpler kind occurs when the last note of any bar and the first note of the bar succeeding are tied together by a "bind," and thus form in reality only one note.

Syncope (sĭn'kō-pē). See FAINTING.

Synecdoche (sĭn-ĕk'dō-kē), a figure of speech which displaces an ordinary term by one which naturally suggests it, on account of the relative whole to part or part to whole, genus to species or species to genus; thus *city* for *people* of the city, *blade* for *sword, bald head* for *bald-headed man, bird* for *fighting cock, man* for *humankind,* etc.

Syn'ergism, in theology, the view that God and man share in the work of regeneration, the human will responding to the Spirit of God. So Melanchthon taught, opposing the view of Luther as to the bondage of the will and its complete passivity in conversion.

Syno'vial Mem'branes, connective-tissue membranous structures which surround the closed cavities connected with the joints, or occur about certain tendons or between opposed movable surfaces, their purpose being to lessen friction. They resemble serous membranes in structure, but are distinguished from them by the viscid or glairy character of the fluid with which they are lubricated, in contrast to the thin watery secretion bathing the serous surfaces. The synovial fluid consists of nearly ninety-five per cent of water, rendered viscid by mucus, endothelioid cells, fat, albumen, and salts.

Syn'tax, that branch of grammar which treats of the position and relations of words in a sentence. In Greek, Latin, and other inflectional languages, the coördination is shown by the terminations of the words, and their order in the sentence is of little consequence; but in English, which has but few inflections, the relation of the words is shown by their order in the sentence. See GRAMMAR.

Syn'thesis. See CHEMISTRY.

Sy'phax. See MASINISSA.

Sy'phon. See SIPHON.

Syra (sē'rä), ancient *Syros*, an island of the Cyclades belonging to Greece; area, 44 sq. m. During the Greek revolution it was used as a refuge for fugitives. It is now the commercial center of the Ægean Sea. Capital, Hermopolis; pop. (1896) 26,856.

Syr'acuse, (1) a province of Sicily, on the E. coast; area, 1,429 sq. m. It is chiefly mountainous, but the S. is a plain. The principal products are grain, barley, olives, wines, fruit, flax, and hemp. (2) A fortified city (ancient *Syracusæ*), the capital, 81 m. S. by W. of Messina; communal pop. (1901) 32,030. It has a fine cathedral, numerous palaces, and extensive ruins. It trades chiefly in oil, wine, brandy, fruit, salt, saltpeter, and sulphur. The ancient Syracusæ was the largest city of Sicily, with a pop. est. at 500,000, 900,000, and even 1,200,000. It really consisted of five towns, separated by walls—*viz.*, Ortygia (the original city), Achradina, Tyche, Neapolis, and the Epipolæ, and hence was sometimes called Pentapolis. After the Roman conquest its limits became restricted; under Augustus it occupied only Ortygia and the lower part of Achradina, and since its capture by the Saracens the town has been confined to the Ortygian peninsula.

The peninsula and the lowland portion of Achradina and Neapolis present evidences of former splendor. Near the borders of Tyche, Achradina, and Neapolis is the ancient theater, hewn out of the rock, 440 ft. in diameter, contained sixty ranges of seats, all cut in the rock; it could accommodate 24,000 spectators. The lautumiæ or latomiæ, originally quarries cut in the wall of rocks which formed the face of the heights of Achradina, and excavated to the depth of 60 to 80 ft., are still perfect. Near the theater is that remarkable prison cut in the rock, now called the "ear of Dionysius." There are also catacombs of great extent. Near the left bank of the Anapo, outside the walls, are the ruins of the Temple of Jupiter Olympius. The celebrated fountain of Arethusa has been repaired and beautified. Syracuse was founded by the Corinthians, under Archias, about 734 B.C. Within seventy years it began to send out colonies.

In 486 an oligarchy called the Geomori, or Gamori, which had usurped the government, was overthrown. The Geomori withdrew to Casmenæ, but Gelon, despot of Gela, restored them to power, reserving for himself the supreme government. Hiero, his successor (abt.

478), promoted literature and art. His brother and successor, Thrasybulus, was expelled, and a popular government was instituted. In 415 the Athenians formed a league against Syracuse, but their expedition ended in disaster. Dionysius the Elder made himself despot of the city in 405, and ruled vigorously but tyrannically for thirty-eight years. After defeating the Carthaginians (397), he extended his dominion over the greater part of Sicily and a part of Magna Græcia. He was succeeded in 367 by his son Dionysius the Younger, who was finally overthrown by Timoleon in 343. The restoration of liberty was followed by unexampled though brief prosperity. Twenty-six years later Agathocles acquired despotic power, and used it for twenty-eight years to plunge Syracuse into new and destructive wars. Soon after his death (289) new tyrants assumed the sway, till in 270 Hiero II obtained supreme power, and maintained a firm and judicious administration for fifty-four years. He was a steadfast ally of Rome. His grandson and successor Hieronymus abandoned Rome for Carthage, which ultimately led to the siege of Syracuse by Marcellus (214–212), a siege rendered illustrious by the patriotic efforts of Archimedes, but which finally resulted in the capture and plunder of the splendid city.

Syracuse fell into decay; yet in the fourth century A.D. it was still one of the largest cities of Sicily. It fell into the hands of the Goths, was recaptured by Belisarius in 535, and in 878, after a siege of nine months, sacked and burned by the Saracens. In 1088 Count Roger of Sicily made himself master of Syracuse. It was partially rebuilt and fortified by Charles V, but in 1542, 1693, and 1757 was nearly destroyed by earthquakes.

Syracuse, city, county seat of Onondaga Co., N. Y.; on Onondaga Lake; 147 m. W. by N. of Albany and 150½ m. E. of Buffalo. It is at the foot of Onondaga valley, in the lake region of Central New York. Salina Street is the principal thoroughfare, crossing the city from S. to N., and W. Genesee Street, part of the old turnpike from Albany to Buffalo, crosses the city from E. to W. The streets contain so many trees that during summer the city, viewed from adjoining hills, appears to be buried in a forest. The city's water system has its source in Skaneateles Lake, 18 m. distant, and is considered one of the finest in the U. S.

Syracuse is the fourth city of the state, measured by the value of its manual product. The census of 1900 gives the number of factories as 1,383, with a capital of $31,358,055, employing an average of 14,917 persons, and producing articles valued at $31,948,055. The leading industries are clothing, iron and steel, typewriters, automobiles, chemicals, furniture, wagons, agricultural implements, candles, electric supplies, and malt liquors. Syracuse was settled in 1797, and was known first as Bogardus Corners; afterwards as Milan, South Salina, Cossitt's Corners, Corinth, and in 1824 Syracuse. In 1826 the village was incorporated; in 1847 the rival villages of Syracuse and Salina were brought into a city corporation. The Jesuits, in 1654, were the first to visit the locality, then inhabited by Indians (Onondagas), a remnant (425) of whom now occupy a reservation 6 m. S. of the city and 6 m. sq. Pop. (1910) est. at 133,000.

Syracuse Univer'sity, coeducational institution at Syracuse, N. Y.; founded 1848; located at Lima, N. Y., and known as Genesee College until 1871, when it was removed to Syracuse, the most prominent citizens and the city giving $100,000. The campus comprises fifty acres; has hall of languages, Holden Observatory, fine arts, and the library building, containing the famous library formerly the property of the historian Von Ranke, with 61,618 volumes and pamphlets, the Young Men's Christian Association hall and gymnasium. The athletic field is one of the finest in the state. The medical college is near the center of the city. A college of law was opened in 1895. The value of grounds and buildings is $2,185,700, the endowment fund is $1,313,610, and the total income $132,611. In 1909 the number of students was 3,300.

Sy'ria, a vilayet of the Ottoman empire in Asia Minor; bounded N. by the vilayet of Aleppo, E. and S. by the Syrian and Arabian deserts, W. by the Mediterranean. It comprises the ancient Phœnicia, Cœle-Syria, and Palestine. Two parallel ranges, Lebanus and Anti-Libanus, run southward, and the chief rivers are the Euphrates, the Orontes and Jordan, and the Leontes. Earthquakes are frequent. The climate is parching and the heat oppressive. The scourge of the country is the locust. Above all, however, the misfortune of Syria has been its geographical position, rendering it the battlefield of races and religions. The mountain slopes are covered with pine, fir, and oak. Cedars are still found in Lebanon; laurel groves are frequent in the valleys; extensive forests are rare. Farming tools and implements of all sorts, as well as the system of cultivation and handicraft, are of the simplest. The common cereals are wheat, rye, and barley; rice, dhurra, sesame, lentils, and beans are raised. Cotton, hemp, madder, indigo, melons, cucumbers, and artichokes are extensively cultivated. The tobacco along the coast is of excellent quality. Plantations of fig, orange, lemon, mulberry, peach, pomegranate, and almond, and the vineyards yield excellent returns. The coffee plant has been introduced at Latakia, the sugar cane at Beirut, and Damascus is surrounded by orchards and gardens. All the domestic animals of Europe are found in Syria, as is also the camel. The wild animals are jackals, hyenas, antelopes, the Syrian bear, wolves, and especially wild boar, deer, and wild buffalo. The silkworm is extensively reared. Mining is hardly carried on.

There are no reliable statistics as to population. It is probably not far from 1,500,000, and is made up of heterogeneous races, peoples of Semitic origin predominating. Arabic is the generally spoken language, and French much employed by the higher classes. Tribal divisions are rather on the score of religion than origin or race. The country swarms with sects —Mussulman, Jewish, and Christian, equally zealous and intolerant. The chief cities are

Damascus, Aleppo, Beirut, Jerusalem, and Homs. The earliest known inhabitants of Syria were Semites, such as the Canaanites, Phœnicians, Aramæans, the latter of whom held Damascus and ruled to the Euphrates. Such, too, were the Hebrews. Practically all Syria, except Phœnicia, became subject to the Hebrew monarchy under David. When on the death of Solomon the Hebrew empire divided into the two kingdoms of Judah and Israel, an independent Aramæan monarchy under Rezin was set up at Damascus. Its kings conquered N. and central Syria. Tiglath-Pileser, King of Assyria, subdued this state, capturing Damascus (740 B.C.), and likewise Israel (720 B.C.). Judah was conquered by Nebuchadnezzar, King of Babylon, in 587 B.C. Syria passed from the Assyrians to the Babylonians, then to the Medes, then to the Persians, and after the battle of Issus (333 B.C.) to Alexander and the Greeks. During these transitions many nonsemitic elements were introduced. On the death of Alexander the Seleucidæ founded a Syrian empire, which they ruled from 301 to 64 B.C. Antioch, built by Seleucus I (301–281 B.C.), was their capital. The Syrian Empire at its height rivaled in extent that of Alexander. Antiochus III, the Great (223–187 B.C.), was a most formidable enemy to Rome. Antiochus XIII (69–65) was overthrown by Pompey, who made Syria a proconsular Roman province (64 B.C.). Syria continued part of the Roman and then of the Byzantine Empire, but (635–638) was gradually conquered by the Mussulmans. Damascus was made the capital of Syria in 654; under the Ommiade dynasty of caliphs it continued the capital of the entire Mussulman Empire (661–752). The Abasside caliphs degraded Syria to the rank of a province and removed the capital to the newly founded Bagdad. Distracted by rebellions and by frequent wars between the caliphs and the Byzantine Empire, the condition of Syria became deplorable, till it fell under the humane sway of the Seljuk sultan Malek Shah (1073–93). Next the crusaders deluged the country, and from 1099, when the Christian kingdom of Jerusalem was set up, until 1291, when Acre, the last Christian stronghold in Syria, was retaken by the Mussulmans, was the most disastrous period Syria has ever known. From that time, except during the invasions of Tamerlane and his successors, Syria was ruled by the Mameluke sultans of Egypt until 1516, when it was conquered by Sultan Selim I. From 1832 to 1841 it was governed by Ibrahim Pasha. With the exception of this brief period, it has, since the days of Sultan Selim, formed part of the Ottoman Empire.

Syr'iac Lan'guage. See ARAMAIC.

Sy'ros. See SYRA.

Syr'tis, Ma'jor and **Mi'nor,** the ancient names of the two large inlets, or rather of the two opposite angles (E. and W.) of the great almost rectangular reëntrant in the S. coast of the Mediterranean, of which the margins are the coasts of Tunis and Tripoli. They are now called, respectively, the Gulf of Sidra and the Gulf of Cabes. They are shallow and dangerous to navigate on account of quicksands and the uncertainty of the tides.

Systole (sĭs'tō-lē). See HEART.

Szegedin (sĕg-ĕd-ēn'), after Budapest the most populous city of Hungary, at the junction of the Maros with the Theiss; 118 m. SE. of Budapest. The old Turkish castle is the sole reminder that Szegedin was once an important fortress. In 1879 the town was submerged by inundation; almost half the houses were destroyed and nearly 2,000 persons perished. Soda, soap, and cloth are made on a large scale, and trade is carried on in corn, wine, tobacco, salt, and lumber. The town is famous for its floating mills and river boats. The Hungarians were defeated here by the Austrians (1849). Pop. (1900) 102,991.

T

T, the twentieth letter of the English alphabet, derived from the Greek **T** or tau. Its sound is like d, but softer; t is silent in hasten, listen, often, etc.; as ti before vowels it has the sound of sh; as *sti* its value is tsh, as in question, Christian. In the combination *th* it represents a spirant, either voiceless, as in *thin*, or voiced, as in *then*.

Symbolism.—T = Tuesday, ton, Tullius; Ta = tantalum; Te = tellurium; Th. = Thursday, thorium; Ti = titanium; Tl = thallium. See ABBREVIATIONS.

Tab'ard, The, a famous inn at Southwark, London, whose sign was a tabard or the sleeveless coat worn by heralds. It was demolished in 1866.

Tabas'co, a SE. state of Mexico; area, 10,072 sq. m.; of fertile soil, raising maize, cacao, and sugar cane. In general it is one of the least progressive of the Mexican states. Pop. (1900) 159,834. Capital, San Juan Bautista.

Tab'ernacle, a tent erected, under divine directions (Exod. xxv–xl), by the Israelites at Mount Sinai, and carried with them into the Holy Land. It was the place where God should especially manifest His presence, and where they should offer to Him their sacrificial worship, and was replaced by Solomon's Temple, which exactly doubled its dimensions.

It was a rectangle 45 ft. long and 15 broad and 15 high. It consisted of two adjoining rooms, with an outer court surrounding both. The inner room, an exact cube, contained the ark of the covenant; over this were the figures of two cherubim, and between them the Shekinah. The only access to this room, which was called "the holy of holies" (Heb. ix, 3, 7), was from the outer room, which was called "the holy place" (Heb. ix, 6), of the same width and height, but just twice the length. Between them hung a double curtain, which was passed only by the high priest, and by him only on one day of the year, the great Day of Atonement. In the outer room was the golden censer, the golden altar on which incense was burned every morning and evening, the table of shewbread, on which were twelve loaves of bread, replaced each week, and the golden candlestick, lighted every evening. Into this the high priest and the priests entered daily, in the course of their regular ministrations, but no others. In the court the principal object was the large brazen altar, on which sacrifices were burned. Between this and the sanctuary itself was the brazen laver for the ablutions of the priests. This court was entered by all Israelites—who must be ceremonially clean—who came to offer sacrifices. The entrance to this also was by a hanging of curtains gorgeously wrought in colors, supported on pillars, and was twenty cubits in width. The three entrances were thus in one line, all facing eastward.

Tabernacles, Feast of, the last of the three great annual festivals, at which all the males of Israel were required to present themselves at the sanctuary (Lev. xxiii, 33–43). It lasted seven days, and on the eighth was a "holy convocation." It occurred in the last part of September and first part of October, after the harvest, and was called "the feast of ingathering." The participants dwelt in booths roofed with boughs, in memory of the wilderness wandering. The sacrifices were specially arranged (Num. xxix, 13–38). Further, the priest drew water in a golden pitcher from the Pool of Siloam, and poured it on the altar amid the rejoicings of the people; and two great lights were set up in the court which are said to have illuminated nearly the whole city.

Ta'bes Dorsa'lis. See LOCOMOTOR ATAXIA.

Ta'ble-land. See PLATEAU.

Table Moun'tain, a mountain of S. Africa, S. of Table Bay, its highest point being right over Cape Town. It is about 3,500 ft. high, and level on the top. It joins the Devil's Mount on the E., and the Sugar Loaf or Lion's Head on the W.

Taboo', or **Tabu,** a Polynesian interdict which makes persons, places, or things sacred, so that certain persons cannot touch or come near them without becoming defiled and outlawed. The system of taboo penetrates the whole social life of most of the unchristianized Polynesians, and is a powerful agent of chiefs and priests in controlling the people.

Ta'bor, Mount, an insulated mountain of N. Palestine, in Galilee, 6 m. SE. of Nazareth, rising 1,053 ft. above the plain and 2,018 ft. above the sea. It is often mentioned in the Old Testament, and was from the fourth century generally regarded as the scene of the transfiguration of Christ, although it is now known that at the time when that event took place its summit was occupied by a fortified town.

Tabriz, or **Tabreez** (tä-brēz'), capital of province of Azerbijan, Persia; 40 m. E. of Lake Urumeyah. It is in the midst of a fertile and well-cultivated plain, and surrounded by gardens. It is poorly built, with no important public edifices, except the remains of the Blue Mosque, a marvel of decorative art that was destroyed by the earthquake of 1780, and the ark citadel. Its bazaars are mean buildings, but extensive, and there are important manufactures of silk, arms, shawls, tobacco, and leather, and a large transit trade. Marco Polo visited it abt. 1293. It has suffered severely by fire, earthquake, and by the invasions of Turks. Pop. est. at 200,000.

Tabu'. See TABOO.

Tachyg'raphy. See PHONOGRAPHY; STENOGRAPHY.

Tacitus (tăs'ĭ-tŭs), **Caius** (or **Publius**) **Cornelius,** abt. 55–117 A.D.; Roman historian. He was early appointed to a public office under Vespasian, and married a daughter of Julius Agricola. He held a prætorship under Domitian, and was *consul suffectus* under Nerva. Nothing positive is known of his subsequent career except that late in life he was proconsul in Asia. He was a famous orator and lawyer. His "Vita Julii Agricolæ" is the masterpiece of biography. His "Germania" appeared soon after, both probably in 98. Abt. 105 appeared the first portion of his history of Rome, embracing "Historiæ" of the years 69–96 A.D. Only the first four books and a part of the fifth are extant. Next appeared the "Annales," a concise history of the events from A.D. 14 to 68. Of the original sixteen books, only nine complete and parts of three others are extant.

Tacitus, Marcus Claudius, abt. 200–276 A.D.; Roman emperor. After the assassination of Aurelian, 275, Tacitus, who had held various offices and was noted for wealth and integrity, was unanimously elected emperor by the senate. He instituted domestic reforms. According to one account, he was assassinated by his soldiers when on an expedition against the Goths in Asia Minor.

Tack'ing and Wear'ing, the common methods of working a vessel from one tack to the other; they differ in that, while in tacking the vessel turns toward, in wearing it turns from the wind. Square-rigged vessels when close hauled lie within about six points of the wind; fore-and-aft-rigged vessels lie a point or two higher; therefore, in tacking a ship turns through twelve and in wearing through twenty points of the compass. A vessel wears when, through high winds or heavy weather, or some other reason, tacking is impracticable. If in tacking a vessel comes up into the wind and lies there, it is said to be *in irons*; it may then by shifting the helm be made to fall off on the other tack when stern board is gathered, otherwise it may be boxed off on the same tack. See BOX HAULING.

Taco'ma, capital Pierce Co., Wash.; on Commencement Bay and the Puyallup River; 25 m. NE. of Olympia, and 28 m. S. of Seattle. The Puyallup River empties within the city limits, and aids in making a fine natural harbor, and the shipping facilities are excellent. Most of the manufacturing and railway industries are in the E. part, on or about the level tide flats at the head of the bay. The business and residence portions are on a bluff 80 ft. above the water, on ground rising gradually to 320 ft., to a level plateau, over which the city is spreading. The surrounding waters, forests, and snow-capped mountains are of unusual grandeur, with the Olympic or Coast Range in the W. and the Cascade Range in the E.; Mount Tacoma (by some called Mount Rainier) rises over 14,526 ft. Wright Park, containing 40 acres, and Point Defiance Park, 662 acres, are the principal parks. The region immediately S. of the city is a park land of much beauty.

Tacoma is well supplied with churches, the membership exceeding 10,000. The public schools occupy twenty buildings, and there are over twenty private academies and business colleges. In 1881 a cargo of wheat valued at $51,000 was shipped from Tacoma to Liverpool in an American bottom. Since then there has grown an ocean commerce which in 1900 aggregated $15,545,497 in exports of wheat, flour, coal, lumber, canned salmon, etc.; and the imports—mostly from China and Japan—amounted to more than $12,000,000. The coastwise shipping is extensive. About $12,000,000 is invested in manufacturing industries. The plants include large car shops and sawmills. Over 3,000 persons are employed in other works. Tacoma is one of the most important shipping and distributing points on the Pacific coast. Tacoma City, now the First Ward and called Old Town, was laid out in 1868 by Gen. M. M. McCarver. On July 14, 1873, the Northern Pacific Railroad Company established its Pacific terminus on Commencement Bay, naming it New Tacoma; in 1880 the town became the county seat, and in 1883 the two towns were consolidated as Tacoma. Pop. (1910) est. at 120,000.

Tacoma, Mount. See RAINIER, MOUNT.

Tac'tics, the art of drawing up military or naval forces in order of battle and of performing military or naval evolutions.

MILITARY TACTICS is the art of so handling bodies of troops as to utilize to the fullest extent the fighting, maneuvering and resisting capacity. When applied to the combined action of larger masses, of different arms, on the field of battle, it is called grand tactics. When restricted to actions of small bodies or single arms it is called minor tactics.

Minor tactics include drill regulations, or drill, formerly called in the U. S. by the general name of tactics. The object of drill is (1) to enable the commanding officer to place each and every soldier on the spot he is to occupy, in any desired formation, in the most rapid manner consistent with complete control at all stages; (2) to enable the soldier to use his weapon in the most effective way in action, and to carry it with the least fatigue; (3) to execute properly formations and movements of ceremony, such as parades, reviews, etc., to preserve the pride of the soldier in his own appearance and that of his command. The field of minor tactics now embraces the subjects of information and security, including outposts, reconnoissance, and the handling of advance and rear guards; marches, instruction of the three arms in all that refers to the use of their weapons and their employment upon the field of battle. The most marked changes which result from the increased range and accuracy of firearms are forcing the enemy to deploy and open fire at much greater distance, enlarging very much the area covered by the effective fire of a battery, thus necessitating fewer changes in its position and giving a larger latitude in its selection. They also allow the artillery to open the combat at a distance from the enemy which can be traversed by him only with such losses and in such time that the artillery may safely march at the head of a column, open fire, and receive support before it is endangered by the approach of the enemy.

The correct tactical use of artillery requires the concentration of its fire upon properly selected targets, and the modern improvements have added largely to its efficiency by facilitating this; while the great distance at which a destructive fire can be poured upon a body of cavalry, by both artillery and infantry, has almost entirely changed the tactical use of mounted troops on the field of battle, narrowly limiting the opportunities for a successful charge upon infantry or artillery in position. The changes made since the time of the Romans in the arms and equipments of the cavalryman, as distinguished from the dragoon or mounted infantryman, have reduced themselves almost entirely to the addition of the revolver and the abolition of body armor. The first adds somewhat to his aggressive value, while the second is the direct result of the improvement in the infantry weapon. The most marked change in modern cavalry is the conversion of all mounted troops into dragoons, armed with a rifle or carbine, and trained to fight on foot or mounted; or even in some cases into mounted infantry who use their horses for transportation only and fight on foot. In recent operations cavalry has been used as a veil or screen, to cover the advance of the rest of the army, to a much greater extent than it was formerly. Scouting, reconnoissances, and map making have become important parts of the duties of cavalry.

The modern minor tactics of infantry begin an action with a dispersed skirmishing line, in which the front of each battalion or company is covered by its own men, who are reënforced and strengthened by their own comrades and commanded by their own officers, thus avoiding the disorganization resulting from mingling different commands on the front line of battle. In attempting to accomplish this, great prominence is necessarily given to the advance of successive lines in open order, which, by short rushes and by taking advantage of all possible cover, may diminish as much as possible the losses caused by modern small arms and machine guns, and at the same time collect for the final charge a strong line of companies and battalions.

Grand tactics includes planning battles, perfecting the preliminary arrangements, conducting them during their progress, and securing the results of victory or avoiding the consequences of defeat. Battles are usually preceded and followed by minor actions, classed as combats, skirmishes, etc., which are generally not intended to be decisive. Battles are classed as offensive, defensive, and defensive-offensive, the latter name being applied to those actions in which the attack having exhausted its strength, the defense takes the offensive to gain the victory. In great battles the fighting is not carried on in the same manner at all points of the line. False attacks and demonstrations of the class known as "containing movements" are made at some parts of the line, while the strength of the attack is concentrated at another, thus "making oneself stronger than the enemy at the time and place of actual conflict," which is the very soul of success. It is this principle which, by overshadowing all others, has led to the statement that "the rules of tactics are invariable, and are the same now as they were in the time of Alexander." This is true only of grand tactics. History shows that success has generally attended the aggressive leader when other things were equal; but when an army is weak in men, in training, or in morale, its leader can only seek to give it superior strength in actual conflict by fighting a defensive battle in a well-selected position made strong by fortifications, against which the enemy may exhaust his superior strength.

NAVAL TACTICS.—The subject may be divided into grand tactics, or the tactics of battles, and elementary tactics, or the tactics of instruction. The history of naval tactics can very properly be separated into three grand divisions. The first, the oar period, begins where tradition merges into history, and ends about the battle of Lepanto (1571), covering about two thousand years. The second, or sail period, is embraced between Lepanto and the battle of Lissa (1866), lasting only two hundred and ninety-five years, since which time there has been only the steam period, yet in its infancy. The key to any system of naval tactics is the line of battle. If, in the line of battle, the vessels are all in line—or, as it was called in the tactics under sail, "line abreast" and heading toward the enemy—we have the line of battle of the oar period, when war galleys were armed at the bow with a spur (rostrum), and depended for success in battle on ramming and sinking the galleys of the enemy or grappling and boarding him. This formation gives us also the line of battle of modern fighting ships when their principal offensive power lies in their rams. If, however, the power of the ship lies in her broadside (artillery placed on the side of the ship), it is obvious that such ship must present her broadside to the enemy, in which case the line of battle must be the "line ahead," or, as it is now properly called, in "column." In addition to the above, there are certain "orders" in which it is convenient for a fleet or squadron to navigate the sea, to go in and out of port, to anchor, and to get under way. To change from one of these orders to another, or to change from any given order of steaming to the order of battle, constitutes elementary tactics. The disposition of the fleet for actual contact with the enemy under various conditions constitutes grand tactics. It was in the tactics of battle that Nelson's genius was most conspicuous.

An assembly of twelve or more line-of-battle ships, or vessels of equal value, is called a fleet, and is separated into three divisions of one, two, or three squadrons each, each squadron comprising not less than four vessels. The commander in chief commands the entire fleet; the second in command, the van division (or right when in line); the third, the rear division (or left when in line); and the fourth, the center.

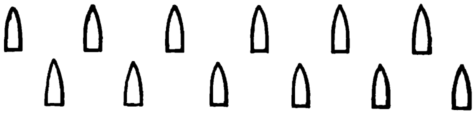


FIG. 1.

The line, the order of battle for line-of-battle ships, rams, and torpedo vessels, is formed as in Fig. 1. The column is the order of battle for vessels whose principal power is in their broadside batteries. (Fig. 2.)

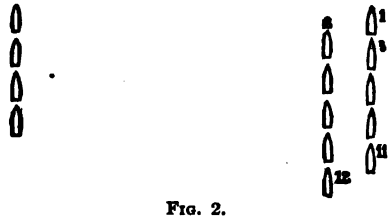


FIG. 2.

Double echelon orders are offensive (salient angle) and defensive (reëntrant angle) for vessels for all descriptions (Fig. 3). Vessels are said to be in direct single echelon when, steering the same course, each bears from its next astern at an angle of 45° (four points) from the course; consequently the wings of a fleet in double echelon form a right angle. One vessel should always be designated by signal to act as guide, by which the movements of the other vessels are to be governed, and should wear a guide flag at the main. When maneuvering, the vessel upon which a formation is made must necessarily be the guide. When the fleet is in line in natural order, the van squadron is on the right (Fig. 4). This was the line of battle formed by Callicratidas the

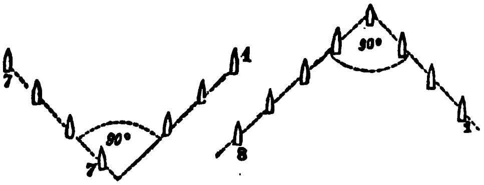


FIG. 3.

Spartan, at the battle of Arginusæ, his fleet being composed of 300 galleys. The fleet in column is in the natural order when the van squadron is leading.

Fig. 5 exhibits the fleet in column of squadrons, or of fours. Should signal by fours, left wheel, be made, each squadron on coming into line must find its place in the line without crowding or confusion. It was this evolution that was performed by Cnemus, commander of the Lacedæmonian fleet, in the battle in the Crisean Bay, when he engaged the force under Phormio, the skillful Athenian tactician, then guarding Naupactus, the modern Lepanto. These two illustrations show how closely the fleet tactics of the oar period resemble those of the steam period. The single line, as in Fig. 4, is easily shattered or doubled up. It should therefore be reënforced as in Fig. 1. As the single column may be broken and the rear ships cut off, it, too, should be reënforced as in Fig. 2. In any case, there should be a reserve (R, Fig. 2), ready to succor any portion of the fleet that may need it.

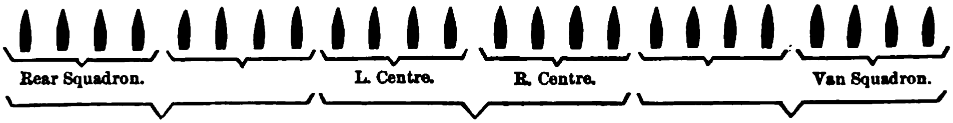


FIG. 4.

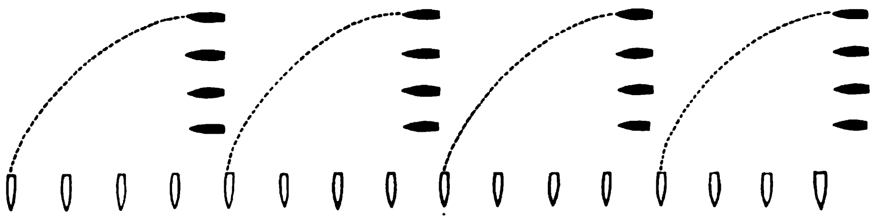


FIG. 5.

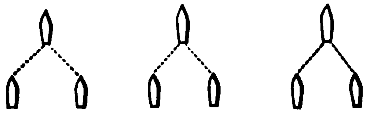


FIG. 6.

A strong order of battle is the French peloton formation, for facility of maneuvering, affording mutual support, etc. Three vessels act as a unit, and these pelotons may be formed in line (Fig. 6), in column (Fig. 7), or in echelon.

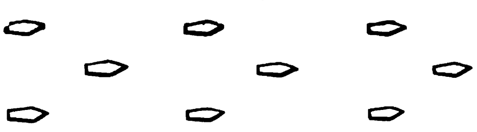


FIG. 7.

The simple orders are the line, column, and echelon; compound orders are those wherein the squadrons or divisions, considered as units, are ranged on one of the simple orders. See STRATEGY.

Tad'pole. See FROG.

Tæ'nia. See TAPEWORM.

Taft, William Howard, 1857– ; American jurist and twenty-seventh President of the U. S.; b. Cincinnati, Ohio; graduated at Yale, 1878, and at the law school, Cincinnati College, 1880. He was law reporter on the *Cincinnati Commercial,* 1880–81; assistant prosecutor Hamilton Co., 1881–82; collector of internal revenue, First District, Ohio, 1882; judge of the Superior Court of Ohio, 1887–90; Solicitor-general of the U. S., 1890–92; and U. S. judge, Sixth Circuit, 1892–1900. In March, 1900, he was appointed president of the commission to organize civil government in the Philippines, and on July 4, 1901, became civil governor of the islands. In 1903 he was appointed Secretary of War. In 1904 visited Panama to confer with authorities, by direction of the President, upon questions with reference to the Canal Zone; made inspection tour of Philippine Islands with congressional delegation in 1905; made a tour around the world in 1907; elected President of the U. S., November, 1908.

Taglioni (tăl-yō'nē), celebrated family of dancers and ballet masters, of Italian origin, but principally connected with the Royal Theater, Berlin. The most illustrious member was Maria Taglioni (1804–84); b. Stockholm. She made her début in Vienna in 1822, danced in all the capitals of Europe, and created great enthusiasm, especially by her performance of the title rôle in her father's ballet "La Sylphide." She retired in 1847. Her brother, Paul Taglioni (1808–84), b. Vienna, was ballet master in the Royal Theater of Berlin, and composed the ballets "Sardanapal," "Satanella," "Flick und Flock," etc.

Ta'gus, one of the principal rivers of Spain. It rises in the Sierra Albarracin, flows mostly W. and SW. through Spain and Portugal, and empties into the Atlantic at Lisbon; length, 566 m. It is navigable 115 m. from its mouth.

Tahiti (tä′hē-tē), or **Otahei′te**, largest of the Society Islands; in the Pacific, lat. 17° 29′ S., lon. 149° 29′ W. It is high, reaching 7,336 ft. at its highest point, but traversed by beautiful valleys, in which tropical plants grow luxuriantly. It is 120 m. in circumference, with an area of about 600 sq. m., and had, in 1909, 11,691 inhabitants. It is the principal island of the French establishments in Oceania, and contains Papeete, the capital.

Tai′lor, name applied to the bluefish; also sometimes to the fall herring.

Tailor Bird (so called from its habit of sewing together the tips of two or three leaves to make a nest), *Sutoria sutoria*, of the family *Lusciniidæ*; found in India and other Eastern countries. It is about 5 in. long, with a slender and slightly decurved bill, short and rounded wings, and very long tail composed of narrow feathers; olive green above and white beneath, and brick red on top of the head. Its nest is lined with soft downy or cottonlike vegetable substances, and usually contains six to eight eggs.

Tailor Bird and Nest.

Taine (tān), **Hippolyte Adolphe**, 1828–93; French philosopher and historian; b. Vouziers, Ardennes, France; educated at the Collège Bourbon and the École Normale of Paris, and became a teacher, but soon gave it up because of the hostility of the authorities to his ideas. His "Essai sur Tite-Live" (1854) and "Les Philosophes français du XIXe siècle" (1856) attracted attention by their brilliancy and their sharp criticism of the current philosophy of Cousin's school. Influenced by the study of the natural sciences, he sought to apply rigidly to the whole range of human achievements the laws of heredity and environment. He regarded all products of human activity as determined by three factors—environment (milieu), race, and moment. His works include "Voyage aux eaux des Pyrénées," "La Fontaine et ses fables," "Histoire de la littérature anglaise," "Philosophie de l'art," "Philosophie de l'art en Italie," "Voyage en Italie," "Vie et opinions de Thomas Graindorge," "Philosophy de l'art dans les Pays-Bas," "De l'Intelligence Notes sur l'Angleterre," "Origines de la France contemporaine"; 1864 he became Prof. of Æsthetics at the School of Fine Arts, Paris, and in 1878 member of the Academy.

Taiping (tī′pĭng) or **Taeping Rebel′lion**, a formidable insurrection which broke out in 1850 in S. China to overthrow the Manchu dynasty and establish a new purely native dynasty. The rebels were by the Chinese called Ch'ang-mao-tseh, or "long-haired rebels," as they had discarded the queue, or outward expression of allegiance to the Manchus. The leader, a Hakka schoolmaster named Hung-Siu-Chuen, b. 1813, meditated the establishment of a corrupt Christianity elaborated by himself from a vision he had had and from a study of some Christian tracts and books. In this vision he thought he was taken to heaven, where, having been "washed" by an old woman, some venerable sages opened his body with a knife, took out his heart and other parts, and put new parts in their place. A "Church of God" was established, and so zealous were its members in demolishing temples and idols that they came into conflict both with their neighbors and with the authorities, and many fights ensued.

In 1850 they were in open rebellion, Hung taking the name of the "Heavenly King." In 1852 they moved into Hunan, advanced to the Yang-tse, down which they sailed, capturing every important city; made Nanking their capital, threatened Pekin, and carried destruction and death over fifteen of the eighteen provinces of China. It has been estimated that 20,000,000 lives were sacrificed in this struggle. It was not till 1864, when Nanking was recaptured on July 19th by the Ever-victorious Army under "Chinese" Gordon, that the movement began to weaken; Hung himself had already taken poison and his principal generals had fled. The remnant under Tsze Wang made a last stand at Chang-chow-fu, in Fuh-kien, but were pressed so hard by the imperialists that they had to withdraw and disband. The imperial operations were directed by Tsüng-kwoh-fan and Li Hung-Chang, but without the assistance rendered by the British and French at Shanghai and elsewhere, and by the native army drilled and officered by foreigners and led successively by Ward, Burgevine, Holland, Cooke, and Gordon, it is questionable if they would have succeeded in crushing the movement.

Tai-wan (tī-wŏn′). See Formosa.

Taj Mahal (täzh mĕ-häl′). See Agra.

Taku′, Chinese village, at the mouth of the Peiho; 70 m. by water from Tientsin. Here are the famous Taku forts, which, deemed impregnable by the Chinese, were taken three times by the Anglo-French fleets in the campaigns of 1858–60, and again on June 17, 1900, by the fleets of the allied powers.

Talc, a magnesium silicate, which sometimes makes up the mass of geological formations. Talc belongs to the softest minerals, ranking with graphite in the scale of hardness. Its usual color is a light green, but it is found perfectly white. The massive varieties are called soapstone. When powdered it is used for lubricating, and as talcum powder is a popular toilet article.

Tal'ent, ancient Greek weight containing 60 minæ, about 82 lb. avoirdupois. There was a Babylonian and an Æginetan talent, which were to the Attic as 5 to 3; the Eubœan talent was to the Attic nearly as 4 to 3; the Tyrian was equal to the Attic, etc. There was also a gold or Sicilian talent of about three fourths of an ounce, called the little talent. A talent in money was originally a talent's weight of silver or gold, but the talent finally became a money of account. It was among all the Greeks the monetary unit. Its value varied with the kind of talent used and with the purchasing power of gold and silver—from $365 to $1,759.26. The Attic silver talent was smaller than the commercial talent, weighing 57 lb. of silver.

Tal'ipes. See CLUB-FOOT.

Tal'ipot, a palm tree, *Corypha umbraculifera*. It affords great leaves, which are used for covering houses, making umbrellas, and for making a substitute for writing paper that is used extensively in the East, as well as for many other purposes. The pith affords a kind of sago. The tree grows in Malabar and Ceylon.

Tal'isman. See AMULET.

Talk'ing Machine'. See PHONOGRAPH.

Tallahas'see, capital of Florida and of Leon Co.; 21 m. N. of the Gulf of Mexico, 165 m. W. of Jacksonville. It is in an agricultural and fruit-growing region; contains four churches for white people and six for colored, separate public schools for white and colored children, West Florida Seminary, Normal College for Colored Teachers, two libraries, U. S. Govt. building, a national bank and a state bank, and has railway car shops and machine and novelty wood works. Pop. (1900) 2,981.

Talleyrand-Périgord (tä-lä-räṅ'-pä-rē-gōr'), **Charles Maurice** (Duc de), Prince of Benevento, 1754–1838; French statesman; b. in Paris; was compelled by his family to renounce his right of primogeniture on account of his being lame, and was educated for the Church, and attracted much attention by his wit and other brilliant gifts. In 1775 he was ordained priest in spite of his licentiousness, in 1780 was agent general for the clergy, and in 1789 Bishop of Autun. Elected a deputy to the States-General, he was one of the first of the clergy who joined the *tiers état*, and in intimate harmony with Mirabeau and Sieyès he took a prominent part in the Assembly. October 10, 1789, he proposed the confiscation of all Church property; July 14, 1790, he officiated at the grand national festival in the Champ de Mars and consecrated the colors of the national guard; December 28, 1790, he took the oath to obey the constitution, and when the Pope excommunicated him (May 1, 1791) he resigned his see. In the Assembly his speeches on financial, educational, and other reforms exercised great influence. Nevertheless, a rumor was circulated that he was conspiring with the Duke of Orleans, and his friends saved him by procuring for him a diplomatic mission to London. While there his name was placed on the list of *émigrés*.

He lived for some time in London and in the U. S., but returned to Paris in 1796; was Minister of Foreign Affairs, 1797–1807. Recognizing the force of Napoleon, he gave him his loyal support. He negotiated all the treaties of peace of this epoch—the Concordat with the Pope, who relieved him from excommunication and secularized him; the Confederacy of the Rhine, after which he was made Prince of Benevento, etc.; but he disapproved of Napoleon's policy toward Great Britain, opposed his plans with respect to Spain, and when, after the Peace of Tilsit, an alliance was formed between France and Russia, he resigned his office. Before the Russian disaster he predicted the downfall of Napoleon, and entered into communication with the Bourbons; and during the last three years of Napoleon's career he was one of his most active and dangerous enemies. He negotiated the first Peace of Paris, and represented France at the Congress of Vienna. Here he succeeded in dissolving the general feeling of concord with which the powers met, and produced a confusion of jealousy, mistrust, rivalry, and hatred, which he understood how to use to the advantage of France. After the second restoration he fell into disgrace, and during the reigns of Louis XVIII and Charles X took little part in public life. September, 1830, Louis Philippe sent him as ambassador to London, and he established cordial and intimate relations between the courts of St. James and the Tuileries, and concluded the quadruple alliance between Great Britain, France, Spain, and Portugal, April 22, 1834. His "Mémoires" were intended by him to be published thirty years after his death, but in 1868 the publication was postponed for twenty-two years on the proposition of Napoleon III. They were published in five volumes, 1889–91.

Tal'low, the hard fat of animals, more properly called suet, and includes those fats of a less degree of hardness, *e.g.*, lard and grease, as distinguished from oils. The fats obtained from the rendering of animal fats of all kinds are technically known as tallow, and are chiefly used for making soap and candles. The animal fats are hard in proportion as they contain more stearin and palmitin and less of olein. The quality of animal fats is much influenced by the mode of feeding and the food. The quality of tallow is also dependent on its being rendered at a low temperature by steam, the cleanliness of the operation, the character of the animals treated, etc.

Vegetable tallow is found in many seeds. Chinese vegetable tallow is from the husk about the berries of *Stillingia sebifera*; the berries contain a liquid fat. The solid commercial product is white, sp. gr. 0.818, and melts at 99° F.; it is rich in palmitin. Bayberry tallow, from *Myrica cerifera*, also called myrtle wax, is a pale-green, brittle, solid fat from the berries. It molds in the fingers like wax when warm. Other hard vegetable fats are found in nutmeg, palm oil, Japan wax, cocoa butter, cocculus grains, and various species of *Bassia*.

Tallow Tree, (1) of the S. parts of the U. S. and of China, *Stillingia*; (2) the *Pentadesma butyracea* of W. Africa, a tree whose fruit yields a yellowish tallow; (3) the piny dammar tree of India, *Vateria indica*, whose seeds on boiling yield an excellent white tallow.

Tallow Tree.

Tal'mage, Thomas DeWitt, 1832-1902; American clergyman; b. near Bound Brook, N. J.; educated Univ. City of New York, New Brunswick Theological Seminary; pastor Central Presbyterian Church (later known as the "Tabernacle"), Brooklyn, N. Y., 1869-94. The "Tabernacle" was built 1870, burned 1872; rebuilt 1874, burned 1889; rebuilt 1891, burned 1894. He was copastor of the First Presbyterian Church, Washington, D. C., 1895-99. He edited various religious papers, including, after 1890, *The Christian Herald*, and his sermons, published under sensational titles, had a certain popularity in their day.

Tal'mud, a work whose authority was long esteemed second only to that of the Bible, and according to whose precepts the whole Jewish people, with the exception of the Karaites and the Reformed Jews of the nineteenth century, have endeavored to order their religious life. It is composed of two distinct works, which were compiled at different epochs—the Mishna and the Gemara. In the oldest schools "Talmud" signified "a deducing," and designated the process of seeking in the sacred writings support for laws not expressly provided therein. On this account the Mishna, which embodied these deductions, was also known as Talmud. Later on, when learned disputations on the Mishna became more frequent, the name Talmud was employed to denote these more recent discussions in contradistinction to the Mishna proper. In later times they were called *Gemara* (the Aramaic equivalent of Talmud). It was only at a still later period, when the Mishna and the Gemara were no longer transcribed separately, that the name Talmud was applied to the whole of both Mishna and Gemara.

The Mishna consists of six divisions (*Sedharim*): (1) *Zeraim*, laws relating to seeds and products of the fields; (2) *Moedh*, festival celebrations; (3) *Nashim*, women; (4) *Nezikin*, civil and criminal laws; (5) *Kodashim*, offerings and vows; (6) *Teharoth*, ritual cleanliness and uncleanliness. Each division is divided into tracts, and these are subdivided into chapters, which are made up of paragraphs.

During the sojourn of the Jews in Babylon the hope of restoration to the promised land had led to a deeper study of the law and to a resolve to put it into practice when that restoration should be accomplished. At the head of this restoration stood Ezra, "a ready scribe in the law of Moses" (Ezra vii, 6). Not only the forms of temple worship, the many dietary laws, the laws of Levitical purity, but even the agricultural regulations and the whole judiciary code had to be included in the work of reconstruction. Jewish tradition ascribes the continuation of Ezra's work to the *Sopherim* (scribes) or the men of the Great Synagogue (see Synagogue). After these the Sanhedrin of Jerusalem became the chief tribunal. From its decisions there was and could be no appeal. Thus, in the course of centuries, a vast body of laws and usages accumulated which the Torah (five books of Moses) did not directly authorize, but which were transmitted orally from generation to generation, and which Jewish orthodoxy refers back to the time of Moses (Oral Law). Academies arose for the propagation of this stock of tradition, and efforts began to be made to found the traditional enactments upon biblical support.

R. Jehudah Hannasi, simply called "Rabbi" (abt. 160 A.D.) gave final form to the Mishna. There are three versions of the Mishna, one in the manuscripts and editions, another embodied in the Talmud of Babylon, and a third in the Talmud of Palestine. In whole or in part the Mishna has been translated into Latin, Spanish, Italian, French, English, and German.

The Gemara includes the controversies and teachings which arose after the close of the Mishna, one Gemara being elaborated in Babylon, the other in Palestine. It is in general a commentary upon the Mishna, and is remarkable for pregnant brevity and succinctness. Often a single word indicates whole sentences. The Gemara has gathered the utterances which have dropped from the lips of great masters and the traditions which had been preserved of their life and actions. Thus it contains legal enactments, homiletical exegesis of scripture, gnomes, maxims, proverbs, parables, tales, and also medical, mathematical, and astronomical data.

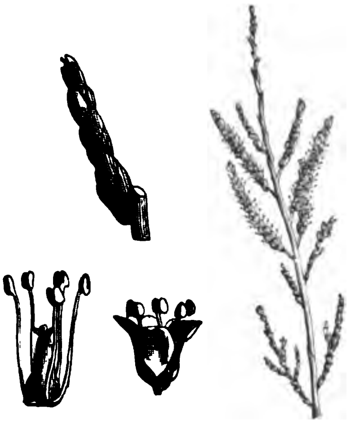
For eighteen centuries Jewish thought has almost wholly moved within a sphere of which the Talmud was the center. The more the Jews were oppressed, the more fruitful did their literary activity become. It kept the soul alive while the body was almost dead. An immense literature has grown out of and around the Talmud. A bare list of such would fill a bulky volume. It is almost impossible to give in one paragraph an idea of what the Talmud is in its entire scope. It has been customary to speak of the Ocean of the Talmud. The metaphor is well chosen. It is a sea into which have flowed the waters of Jewish life and thought. It swarms with a thousand varied forms of life. The Talmud is no dry handbook. It is an open encyclopedia of rabbinical Judaism, containing not only a digest of laws, enactments of ceremonial, moral, religious, and social character, but a record of the discussions themselves on each and all of these subjects; the history of the men who appear on its pages, their sayings and doings, and the record of the events which took place in the political life of the people during so eventful a period. For the great mass of Jews it has been the one regulator of their every action, and has been held in as high esteem as the Bible.

Tal'pidæ. See Desman and Mole.

Tam'arind, a beautiful leguminous tree, the *Tamarindus indica,* from S. Asia and Africa, now naturalized in most warm regions. The pods are filled with a pleasant sour pulp, which is preserved with sugar, and is used for making a drink for fever patients, etc. Tamarind pulp contains citric, tartaric, and malic acids, potash, sugar, vegetable jelly, etc. Tamarind pulp is refrigerant and gently laxative, and is employed in the diseases of children. The tree is sparingly grown in S. Florida and along the N. shore of the Gulf of Mexico. The wood is hard and handsome.

Tamarind.

Tam'arisk Fam'ily, a small group of about forty-five species of shrubs or trees, mostly of the temperate and warmer regions of the N. hemisphere. The most important genus is *Tamarix,* which includes about twenty species, several of which are cultivated for their pretty pink flowers and beautiful foliage. An interesting relationship has been shown to exist between this family and the willow family, in which the flowers are simplified from the tamarisk type.



Common Tamarisk.

Tambourine', a musical instrument resembling a drum, consisting of a wooden or metallic hoop over which a parchment is stretched, and furnished with bells. It is held in one hand, and beaten with the knuckles or fingers of the other hand, also with the elbow. It has been in use from time immemorial in the Basque provinces of Spain and in the retired regions of Italy, especially in the Abruzzi, and is employed by gypsies and wandering musicians, being a favorite instrument for accompanying their dances. It also figures prominently in the Salvation Army.

Tamerlane'. See Timur.

Tam'many Soci'ety, a political society in New York, founded by an upholsterer named Mooney, May 12, 1789. It derived its name from a Delaware chieftain who for his reputed virtues was in the latter years of the Revolution facetiously chosen patron saint of the new republic. Organized ostensibly for charitable purposes, it nevertheless had a definite political character from the first, representing the dread of an aristocracy and the distrust of Hamilton's policy felt by the thoroughgoing Democrats. Secret societies under the auspices of St. Tammany were organized in Philadelphia and other cities; but the institution soon fell into oblivion except in New York, where it was soon a political lever, and became the principal instrument of the managers of the Democratic Party in New York, exerting a considerable influence also upon state politics, and to a less extent on national politics. The society was much discredited by the participation in its honors of William M. Tweed and his accomplices in fraud, but it was reorganized, and to some extent reformed, after the Tweed prosecutions.

Tam'pa, capital of Hillsboro Co., Fla.; at the head of Tampa Bay, at mouth of the Hillsboro River; 30 m. from the Gulf of Mexico. It has an excellent harbor, with 23 ft. of water at the outer bar. The principal industry is cigar making, which has 120 establishments, employs 4,000 persons, and turns out goods of an annual value of $6,000,000. Many thousand tons of phosphate are shipped. Tampa was made a port of entry in 1886, and has grown rapidly since. Pop. (1906) est. at 24,220.

Tampa Bay, a body of water on the W. coast of Florida. Its upper portion is divided into Old Tampa Bay and Hillsboro Bay. It is some 35 m. long and from 6 to 15 m. wide. A line of keys fences its entrance from storms, so that it constitutes a safe, spacious, accessible, and excellent harbor. The bay contains many small islands, and abounds in fish and turtle.

Tampi'co, town and port of the State of Tamaulipas, Mexico; a short distance above the mouth of Pánuco; terminus of railways to Monterey and San Luis Potosí. The harbor has been made good and safe by extensive improvements, so that vessels drawing 24 ft. may enter. The town is built on flat land, surrounded by swamps; in the summer it is hot and unhealthful, but less so than Vera Cruz. The Pánuco and its branch, the Tamesí, are navigated for some distance by small steamers, and there is a canal to afford inland communication. Tampico was opened as a port in 1823, when the fort in Vera Cruz was still held by the Spaniards. During the frequent blockades of Vera Cruz it has been the most important Gulf port of Mexico, and its trade is increasing. Pop. (1900) 16,313.

Tan. See FRECKLES.

Tan'agers, a family of passerine birds, having, as a rule, a thick, conical, triangular bill, with the cutting edges not much inflected and generally notched or toothed behind the tip; the nostrils are placed very high, and the wings are moderate. The colors are in almost all the species quite brilliant. The group is peculiar to the New World, and is chiefly developed in the tropics. Over 300 species have been described. One genus (*Piranga*) is represented in the U. S. by five species, the most conspicuous of which are the scarlet tanager (*P. erythromelas*) and summer redbird (*P. rubra*). They feed upon grass as well as insects, etc.

Tan'agra Figurines', statuettes and groups of terra cotta found since 1873 among the ruins of Tanagra, in the modern provinces of Bœotia, Greece, and extended to similar pieces found elsewhere. The greater number are draped female figures, 6 to 9 in. high, generally made in molds, with the head finished by hand. Many were elaborately colored.

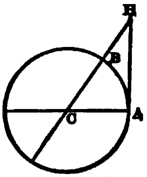
Tananarivo' (formerly ANTANANARIVO), the capital and chief city of Madagascar; situated in a mountainous region in the middle of the island; in 18° 56′ S. lat.; 166 m. SW. of Tamatave (see map of Africa, ref. 8–I). It is built on a series of eminences about 600 ft. above the neighboring valley, and about 5,000 ft. above the level of the sea. It is reported to be a large city and to have manufactures of gold chains and silk stuffs. The private houses are mostly of wood. Pop. (1907) 72,000.

Tan'cred, 1078–1112; one of the most celebrated heroes of the first crusade; b. Sicily; 1096 raised an army in Apulia and Calabria, crossed over to Epirus, joined his cousin, Bohemund of Taranto, and distinguished himself by his valor, sagacity, piety, and chivalric forbearance toward a defeated enemy in Asia Minor and Syria, but still more at the conquest of Jerusalem in 1099, and afterwards in the battle of Askalon. He was made Prince of Tiberias, and governed with wisdom not only his own principality, but also that of Bohemund, who had been captured by the Saracens; but most of his time had been taken up in petty warfare, partly with Baldwin and the other Christian princes, partly with the Saracens. Died in Antioch. He plays a conspicuous part in Tasso's "Gerusalemme Liberata."

Taney (tâ'nĭ), **Roger Brooke,** 1777–1864; American jurist; b. Maryland. In 1816 he was elected to the Maryland State Senate; became Attorney-general of Maryland, 1827, and of the U. S. in 1831. He supported Jackson in his controversy with the U. S. Bank, was appointed Secretary of the Treasury on the dismissal of Duane, September, 1833, and issued orders for the removal of the Government deposits from the U. S. Bank to the local banks selected by him. When his nomination was communicated to the Senate, that body rejected it. In 1835 he was nominated to fill a vacancy on the bench of the Supreme Court, but was not confirmed. He was later appointed to succeed Chief Justice Marshall, took his seat in January, 1837, and held it till his death. The most noted of his decisions was that in Dred Scott v. Sandford (19 Howard, 393), pronounced in 1857 (*q.v.*). In this he denied that Scott, a negro claimed as a slave and suing for his freedom, was entitled to bring suit in the Federal Court, because he was not a citizen; negroes, whether slave or free, having been regarded before and at the time of the Declaration of Independence "as beings of an inferior order, . . . and so far inferior that they had no rights which the white man was bound to respect." Another opinion which was severely criticized was that Pres. Lincoln had no constitutional authority to suspend the writ of habeas corpus. He favored state sovereignty and opposed centralized government.

Tanganyika (tăn-găn-yē'kä), lake of central Africa, between lat. 3° and 9° S. and lon. 29° and 32° E.; about 400 m. in length from NW. to SE.; discovered by Burton and Speke in 1858, and afterwards explored by Livingstone and Cameron. It has an elevation of 2,700 ft. above sea level, deep and clear water, and a very irregular form, its width varying from 10 to 50 m. Area, 12,170 sq. m. It discharges through the Lukuga into the Lualaba, or Upper Kongo. Its shores are generally rich in beautiful scenery, especially those of the N. part, which are set with mountains and hills covered with a luxuriant vegetation. The surrounding country is in many places densely peopled. The most important towns are Ujiji, Bismarckburg, and Albertville.

Tan'gent, in geometry, a straight line which touches or meets a circle or curve in one point, and which being produced does not cut it; a straight line drawn at right angles to the diameter of a circle, from the extremity of it, as HA in figure, which, being continued at A, would merely touch and not cut the circle. In trigonometry the tangent of an arc is a straight line touching the circle of which the arc is a part, at one extremity of the arc and meeting the diameter passing through the other extremity. Thus AH is the tangent of the arc AB, and it is also said to be the tangent of the angle ACB, of which AB is the measure. The arc and its tangent have always a certain relation to each other; and when the one is given in parts of the radius, the other can always be computed. For trigonometrical purposes tangents for every arc from 0 degrees to 90 degrees, as well as sines, cosines, etc., have been calculated with reference to a radius of a certain length, and these or their logarithms formed into tables. In higher geometry the word tangent is not limited to straight lines, but is also applied to curves in contact with other curves, and also surfaces.



Tangier (tăn-jēr′), fortified port and diplomatic capital of Morocco, on the Straits of Gibraltar, 5 m. E. of Cape Spartel, on a shallow, semicircular bay. Its trade is large and increasing. The chief imports are cotton goods and sugar; exports, beans, barley, and wool. Tangier is also of political importance as the only place of residence permanently open for foreigners, whether representatives or private, and it is a favorite refuge for fugitives from justice. The winter climate is exceptionally fine, and is largely resorted to by those who are unable to stand the severer climate of Europe. Pop. abt. 30,000, one third Jews, who transact most of the business.

Tan′häuser. See TANNHÄUSER.

Tannhäuser (tăn′hoi-zėr), b. early in the thirteenth century; German minnesinger; probably a member of the noble family Tanhausen, in Bavaria; lived chiefly at the court of Vienna; participated in one of the crusades; probably joined King Konrad IV, and disappears with the death of King Konradin (1268). He is one of the foremost representatives of the later minnesong, a poet of great talent, of delightful humor, and of a remarkable mastery of the metrical form. He led for a time a very gay life, and the sensuous character of many of his poems, as well as a penitential song which he composed later, may have been the cause of his becoming the hero of the Tannhäuser legend.

According to this legend, Tannhäuser lived for some time with Venus in the Venusberg, but finally was smitten by conscience and begged Venus to allow him to depart. She refused, but, owing to the help of the Holy Virgin, Tannhäuser made his escape and went to Pope Urban (IV) to obtain remission of his sins. The pope answered that Tannhäuser's sins could as little be forgiven as the wand which he held in his hand could become green again. Tannhäuser, in his despair, went back to Venusberg and was received with great rejoicing. Three days after, the pope's wand suddenly began to sprout, and messengers were sent to inform Tannhäuser of this miracle, but on account of his return to the Venusberg he was obliged to remain there till doomsday. The Tannhäuser legend is doubtless one of the stories treating of the fatal union between a mortal youth and an elf which frequently occur in German, Danish, and English folk songs. Venus, in this legend, takes the place of the elf because the minnesinger Tannhäuser frequently addresses in his poems Minne (love) as Frau Venus. The story of the wand which began to sprout in spite of the words of the pope seems to express the popular view concerning the papal abuses in granting the remission of sins.

Tanjore (tăn-jōr′), city of Madras, British India; capital of a district of same name; on the Cavery. It is one of the great religious and literary centers of Tamil India, and is renowned for its artistic industries (silk rugs, jewelry, and copper repoussé), and for its great pagoda. The palace of the rajahs contains a very valuable collection of 18,000 Sanskrit manuscripts. Pop. (1901) 57,870.

Tan′nic Ac′id, or **Tan′nin,** any one of several vegetable astringent principles. The chief sources of these compounds are the barks of varieties of the oak and pine, sumac, kino, divi-divi, and catechu; the bark and berries of many forest and fruit trees, such as the elm, the willow, the horse-chestnut, the plum, the pear. It occurs in tea, especially boiled tea, and by combining with albumen in the stomach interferes with digestion. It has a bitter taste, and is used medicinally as an astringent in a great variety of disorders. With the salts of iron it forms the basis of ordinary writing ink, and its power of combining with animal matter is utilized in the tanning of leather.

Tañoan (tăn′yō-ăn), or **Tan′oan In′dians,** a family of N. American Pueblo Indians, who originally occupied the entire valley of the Rio Grande del Norte. The Tañoans were the frontiersmen of the Pueblo country. On the N. and E. they were contiguous to the Great Plains, and thus to the Utes, Pawnees, Comanches, dog-using Apaches, and other buffalo-hunting or roving tribes. With these they were constantly either at war or on terms of doubtful amity during brief trading truces. Thus they became hardier and more warlike and greater travelers, traders, and hunters than any others of the Pueblo peoples. Their training as mountaineers, and their intermarriage for generations with wilder neighbors, especially with the Shoshonean Utes and Comanches, have had a marked influence on their physical development and appearance. There are now only about 3,300 of them. Isleta, New Mexico, is the most populous pueblo (1,059 inhabitants).

Tan′rec, or **Tenrec,** an insectivorous mammal of Madagascar, with a superficial resemblance to hedgehogs. They are molelike, and burrow in the rice fields, doing much damage.

Tan′sy, a perennial plant of the *Compositæ*, bearing yellow flowers, blossoming from July to

September. It was introduced into the U. S. from Europe, where it is indigenous. It is cultivated in gardens, but also grows in fields and along roadsides. It possesses a strong, not unpleasant odor and an acrid and aromatic taste. The volatile oil of tansy possesses poisonous properties. Tansy tea was used as a supposed tonic. Tansy seeds and leaves are employed, to a slight extent, in medicine.

Tan'talum, one of the rarer elements, a metal discovered in 1802 by the Swedish chemist Ekeberg. It was named from Tantalus because of the difficulty encountered by its discoverer in isolating it.

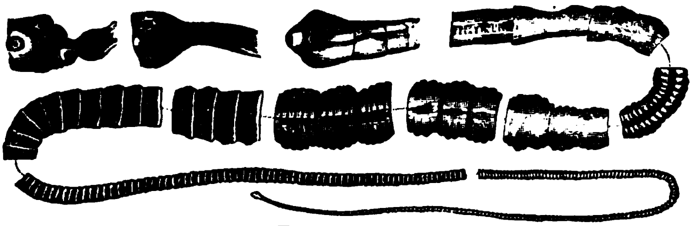
Tan'talus, in Greek mythology, a very wealthy king of Phrygia sometimes wrongly assigned to Argos, Corinth, or Paphlagonia. He was a son of Zeus and a nymph called Pluto (wealth) and father of Pelops and Niobe. He was a favorite of the gods, who often invited him to their banquets, but their favor changed to hatred when Tantalus stole nectar and ambrosia from their table. To test the omniscience of the gods he slew his son Pelops and served him up at a banquet to which he invited the Olympians. As a punishment he was cast down to Tartarus, where, tortured by hunger and thirst, he was made to stand in a lake, whose water receded whenever he tried to drink; rich fruit hung from trees above his head, but was withdrawn whenever he tried to pluck it. According to others, his punishment consisted in eternal fear caused by a huge rock that was suspended over his head and threatened to fall and crush him. The myth is based on facts. The capital city of Tantalus was near Smyrna, and its acropolis and what is called the tomb of Tantalus still exist.

Ta'oism (Chinese *tao*, road, way, or path; word, doctrine, reason, etc.), a philosophy and a religion found in China supposed to be based on the teachings of Lao-tse. Just what philosophic Taoism is depends largely on the meaning of the word *tao*, and there is no word in English which can be used in all cases as a satisfactory equivalent. Some describe it as "Rationalism," or the doctrine of Reason; while still others speak of it as "Naturalism." Lao-tse wished people to cultivate "naturalness," or the simplicity and innocence of former days. It is only when *tao* (or nature) is missed that arbitrary standards are set up, that men become ambitious and violent, and squabble in their eagerness for gain. He who does not act contrary to his nature continues long. Lao-tse inculcated unselfishness under the figure of "emptiness," and humility under the simile of water, which, though good at benefiting all things, always seeks the lowest place. Lastly, he taught that unkindness should be requited with kindness.

Tap'estry, fabric made by weaving or tying threads of worsted, silk, or other material into a warp of strong twine, which warp is not seen in the finished stuff. Tapestry is made entirely by hand and without those repetitions of the pattern which are characteristic of mechanical weaving. It also differs from all weaving in the usual sense in the fact that there is no shuttle thrown from side to side of the web. It is a mosaic of threads held in place only by the warp. Tapestry differs from worsted work chiefly in its greater solidity and in the superior character of the designs executed in it. Both differ from embroidery, in that there is no background, as of cloth or leather, upon which the work is done.

During the fifteenth and following centuries tapestry was made in Flanders, France, and Italy, and probably in other European countries. The most famous center was Arras, France, and the name "arras" was often applied to tapestry of any make. Tapestry was the favorite decoration for walls of rooms and even for the lower part of the interior of churches and chapels. It was hung from hooks and generally left free at the lower edge, so that a certain space might be left between it and the wall. The famous factory of the Gobelins in Paris was established in 1630, the royal factory of Aubusson in 1665, and the royal factory of Beauvais is of the same epoch. These three factories have generally been maintained by the state; they are still so maintained, and their most important productions are not commonly sold. The Bayeux tapestry, so called, is a long and narrow piece of embroidery in worsted on linen, and is therefore not tapestry in any sense.

Tape'worm, any one of the *Cestodes,* a group of parasitic flatworms, the most striking feature of which is the complete absence of an alimentary canal. This is compensated for by the mode of life, as these animals live in the adult state fastened to the inner wall of the digestive tract of some animal, and, being thus surrounded by partially digested food, absorb their nourishment through the body walls. In all there is a head in which is the chief nervous center or brain, and which serves usually by means of suckers or hooks as the organ of fixation. In the simpler tapeworms, which occur in some of the lower animals, the body is undivided and there is but a pair, male and female, of reproductive openings. In the other forms the head, followed by an unsegmented portion or neck, is called a scolex, and behind this occurs a series of joints or proglottids, each of which contains its own set of reproductive organs. New segments are continually formed from the scolex, and this is the reason



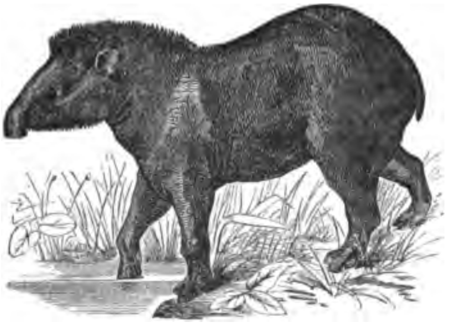
TÆNIA SOLIUM.

why the head of the worm must be removed in order to stop the troubles caused by these parasites.

The largest tapeworm which occurs in man is known as *Bothriocephalus latus*; it may consist of over 2,000 proglottids, and have a length of 40 ft. It is common as a human parasite in Switzerland, N. Russia, and Sweden, but is rare in other parts of Europe. In America it is found only in natives of these countries. *Tænia solium* is the most common tapeworm of man. The tip of the head is surrounded by a double circle of hooks, and the body, sometimes 10 ft. in length, may consist of 800 to 900 proglottids. The ripe proglottids and eggs, cast out from the body, are eaten by pigs, and the embryos, hatching in the intestine, bore through into the muscles, where they develop into the cysticercoid stage. If pork infested with these bladder worms ("measly pork") be eaten in an uncooked condition, the cysticerci are set free and, fastening themselves to the intestinal wall, develop into the adult worm. Sometimes man, by eating lettuce, etc., which has been watered by liquid manure, becomes the host of the bladder-worm stage. The presence of tapeworms in the human being is usually followed by uncomfortable symptoms, and a physician should be called. In domestic animals these parasites sometimes cause death. An infection in man almost always occurs by eating raw or improperly cooked meat.

Tapio'ca, the starch of the manioc ***Manihot utilissima*** (*Janipha* or *Jatropha manihot*). It is prepared by pressing the washed and dried roots under water, when it is obtained in a mealy form, which is converted into a granular condition by drying over hot plates. Upon drying and pressing the pulp remaining in the water, cassava bread is obtained. This, when pulverized, is known as manjok flour. Tapioca is largely consumed as food.

Ta'pir, any one of the *Tapiridæ*, a family of mammals related to the rhinoceroses and horses. All are denizens of deep forests, but near where water abounds, to which they frequently resort. They vary in size from that of a small ass to that of a moderate horse. They had a wide distribution in the Tertiary geological epoch, roaming over Europe and N. America. They are now found widely spread over S. America and northward to S. Mexico; in the Malaccan peninsula, Sumatra, and Borneo. The American species are dark brown. All species are striped or spotted in early youth, but soon assume the livery of full age.



American Tapir.

Tap'ping, or **Paracente'sis,** in surgery, the piercing of the walls of a cavity so as to draw off a collection of fluid. The abdomen, chest, and even the head are so tapped. The trocar and canula answer for the performance of the operation in many cases. In others the fluid has to be removed by an instrument acting as a pump or syringe. Tapping often affords great relief, and occasionally is of great service toward recovery.

Tar, a word associated with pitch and used in a very indefinite manner, usually with a prefix. Tar is a name properly applied to a black, exceedingly viscous fluid distilled in forests from the wood of pine and spruce. In the U. S. the principal supply comes from N. Carolina. The wood is placed in a pit and covered with turf in a manner resembling a charcoal pit. A part of the wood is burned to furnish heat to distill the remainder, and the tar is received into barrels. It is mainly used in preparing the hemp ropes used in the rigging of ships and in calking ships. A different kind of tar is obtained when the wood of deciduous trees is distilled for pyroligneous acid; this is called wood tar. Coal tar (also called gas tar) is obtained when bituminous coal is distilled for gas. A similar liquid called blast-furnace tar is obtained by condensing the vapors that escape from blast furnaces and coke ovens. Bone tar is obtained from the distillation of bone oil or Dippel's oil. Candle tar is a residuum from the stearin manufacture. The word pitch appears to have been applied at a very remote period to asphaltum and maltha or mineral tar. When different tars are distilled, as well as petroleums, various kinds of pitch are obtained. The pitch from the paraffin petroleums is called coke pitch; that from wood tar is the black pitch of commerce. Burgundy pitch is more properly a resin; it is obtained from the European fir, *Abies excelsa*. In Persia and Afghanistan goat and sheep dung is distilled, furnishing a material of a tarry or pitchy consistence that is applied to the goats or sheep to ward off disease. The oily distillate of tar is called oil of tar. See Pitch.

Tar'antism, an epidemic dancing mania, formerly prevalent in Apulia, and especially at Taranto, whence its name. It was believed to be caused by the bite of the tarantula, and doubtless the fright attending the bite may have aggravated the nervous symptoms. The disease was a form of emotional or hysterical excitation. Not only dancing, but catalepsy was one of the symptoms. It was believed that the patients possessed an ardent passion for music and the dance and for bright and beautiful objects. The most successful cure was from hearing and dancing the music of the tarantella, the Sicilian national dance.

Taran'to (ancient name, *Tarentum*), town; in the province of Lecce, Italy; on an island at the N. of the Gulf of Taranto. Two low islands (ancient, *Chœrades*), San Pietro and San Paolo, lie as a protection across the harbor, which is one of the finest in Italy. The most important buildings are the Cathedral of San Cataldo, the church of the archbishop, and a castle erected by Charles V. The vegetation is hardly less luxuriant now than when Horace wrote. Even the date palm bears, though not in its perfection. The honey, the oil, and the fruits of the neighborhood have as great a reputation as ever, and the waters of the Gulf of Taranto are noted for their shellfish, the gathering of which affords much employment. The remains of the ancient town, the largest of all the cities of Magna Græcia (founded 708 B.C.), and once boasting of an army of 30,000 foot and 5,000 horse, besides a strong navy, are insignificant. Pop. of commune (1901) 60,733.

Taran'tula, a large spider (*Tarantula apuliæ*) of the warmer portions of Europe, fabled to cause by its bite the madness called tarantism. In America the term is given to any of the large crab spiders of the tropics.

Tarascon (tă-răs-kôṅ'), town; department of Bouches-du-Rhône, France; on the Rhone, 8 m. N. of Arles. It has manufactures of woolen and silk fabrics, and the Arles sausages are made here. The Gothic church of St. Martha and the castle finished in the fifteenth century by King René of Anjou are its most important buildings. The town celebrates the *fête* of La Tarasque, a monster subdued by St. Martha and described by Daudet in his works devoted to Tartarin. Pop. (1901) 5,762.

Tarax'acum. See DANDELION.

Taren'tum. See TARANTO.

Tares, various leguminous plants, especially of the genus *Vicia*. Some of them are common weeds in the cultivated grounds of the U. S. and Europe. *V. sativa* is cultivated as a forage plant and as a green manure. Its herbage is nutritious. It is probable that the plant called tare in the English New Testament is either darnel or chess.

Tar'gum, name given by the Jews to the Aramæan translations and paraphrases of the Old Testament which became necessary when Hebrew was superseded by Aramæan as the spoken language of Palestine. The word occurs for the first time in Ezra iv, 7, but it is impossible to say when these translations were first made—unofficial ones probably at an early date. We hear of a Targum to Job as early as the time of Gamaliel the elder, the teacher of Paul.

Tari'fa, town; province of Cadiz, Spain; on the Strait of Gibraltar. It is the southernmost town on the continent of Europe. It is surrounded by old Moorish walls within which is an alcazar. Its fisheries for tunnies and anchovies are important, and its oranges are noted for their sweetness. Pop. (1900) 11,730.

Tar'iff, a list or schedule of dues or duties; specifically, a list of duties on imports or exports. The word is popularly extended to the duties themselves, or to the system under which they are levied. Custom duties levied on goods passing from country to country are as old as international trade, being originally the chief means of raising revenue. As early as the sixteenth century, however, duties having a protective purpose appear, and the fostering of certain industries by their means was soon common. A notable example was the French tariff of 1664, and another that of 1667, both due to Colbert. By the eighteenth century every European country had an elaborate tariff system of this sort. Other instruments then used to effect the same end—prohibitions, bounties, premiums, etc.—have generally disappeared, but import duties are still widely used with a view to the protection of home industries. The chief country where they are not so used is now Great Britain, which has been practically a free-trade country since the repeal of the Corn Laws in 1846, and wholly so since 1860.

In the U. S. there are four distinct tariff periods—that of 1789–1816, when tariff legislation was politically subordinate; that of 1816–42, during the early protective movement; that of 1842–60, during which the tariff issue first became a party question; and that since 1861, ushered in by the Morrill Act.

During the first period, duties were imposed chiefly for revenue, beginning with the Tariff Act of 1789, although that act and others of the period had some protective features. In 1804 the duties on cordage, iron, and glass were undoubtedly intended as protective.

In the second period (1816–42) protection was definitely adopted as a principle. The Act of 1816, feeling the stimulus of national feeling due to the War of 1812, raised duties generally. In 1828 the "Act of Abominations" was passed, so called because including certain extreme features intended to kill it. These were dropped in the Act of 1832. The opposition of the South now brought about a reduction of duties intended to decrease them in 1842 to a twenty-per-cent level. In that year, however, the opening of the third period, the Whigs, newly in power, passed a frankly protectionist measure providing high duties on manufactures in general. This was superseded by the moderate Democratic tariff of 1846, which arranged dutiable articles in nine schedules with duties varying from one hundred per cent in Schedule A down to the free list (Schedule I). The system inaugurated by this act continued until the Civil War. At the outset of the fourth, or modern, period the revenues had become low, and the Republicans, controlling the House of Representatives for the first time, passed the high-tariff Morrill Act. In every year of the Civil War acts raising duties still further were passed, especially in 1862 and 1864, the latter becoming the basis of the present tariff system. In 1872 the repeal of the tea and coffee duties seemed to settle the policy of using protective duties as the main source of customs revenue. The McKinley Act of 1890, though admitting sugar free, raised most of the duties, but the Democratic act lowered them again, besides marking a change in policy toward placing raw materials on the free list. The return of the Republicans to power was marked by a renewal of the higher rates. More recent years have shown a tendency of W. Republicans to advocate a reduction of duties; and the act of 1909, making considerable changes in the tariff, was regarded by them as unsatisfactory because the level of rates was in general maintained. See FREE TRADE; PROTECTION.

Tarleton (tärl'tŭn), **Sir Banastre,** 1754-1833; English military officer; b. Liverpool; served under Howe and Clinton in the campaigns of 1777-78; became lieutenant colonel and commanded the British Legion, with which he served in the Carolinas, achieving a reputation for cruelty, so that "Tarleton's quarter" became a synonym for wholesale butchery. He took part in the battles of Camden and Guilford Court House, and at the battle of the Cowpens, January 17, 1781, was defeated by Col. Morgan. He then served with Cornwallis, and was among those surrendered at Yorktown. Returning to England, he was promoted to colonel, and in 1790 entered Parliament for Liverpool, serving till 1806, and again in 1807-12. He was promoted to be lieutenant general in 1817, having previously been appointed Governor of Berwick and Holy Island. He published a "History of the Campaigns of 1780-81 in the Southern Provinces of North America" (London, 1787).

Tarpei'a. See TARPEIAN ROCK.

Tarpei'an Rock, the SE. portion of the Capitoline Hill at Rome. According to tradition, named from Tarpeia, a vestal virgin, who during the reign of Romulus betrayed the Capitoline citadel to the Sabines, having obtained from them the promise that they would give her what they wore upon their left arms, meaning certain gold ornaments. They kept their promise by crushing her beneath their shields. She was buried on the hill. In later times it was customary to hurl condemned criminals from the Tarpeian Rock.

Tar'pon, a large fish, *Megalops thrissoides*, of the family *Elopidæ*; closely related to the herrings. The eye is large, and so is the obliquely placed mouth. The dorsal fin is high, with a long filament behind, the tail deeply forked, the body covered with scales, some more than 2 in. wide, and used in ornamental work. The color is silvery below and on the sides, blue above. The tarpon reaches a length of 6 ft. and a weight of 150 lb. It is found in the warm parts of the Atlantic, and is common on the Florida coast, where it has come much into vogue among anglers, since, in spite of its vast size, it can be taken with rod and line, furnishing rare sport from its vigorous leaps and fine fighting qualities. Its flesh is too coarse for food.

Tarquin'ius, the name of a Roman family of Greek origin, which played an important part in the early history of Rome, and two of whose members became kings. Demaratus emigrated from Corinth and settled at Tarquinii, in Etruria. His son, Lucumo, married Tanaquil, an ambitious and cunning woman, daughter of one of the prominent Etruscan families, and she induced him to emigrate to Rome, where he became a citizen, and assumed the name of (1) LUCIUS TARQUINIUS PRISCUS (the Elder). His wealth and wisdom made him prominent. The king, Ancus Marcius, appointed him guardian of his children, and after the death of Ancus Marcius, 616 B.C., the senate and people unanimously elected him king. He waged successful wars against the Sabines, Latins, and Etruscans, and extended the power of Rome. He built the Cloaca Maxima, laid out the Circus Maximus and the Forum, and began the Capitoline Temple and the stone wall around the city. He instituted the Roman games, and added 100 new members to the senate. He was murdered in 578 B.C., and succeeded by his son-in-law, Servius Tullius. (2) His son, LUCIUS TARQUINIUS SUPERBUS, assassinated Servius Tullius in 534 B.C. and seized the crown. He abolished the reforms which Servius had introduced, and ruled arbitrarily and oppressively, whence his surname Superbus ("the Proud"). The vacant places in the senate were not filled, the advice of this body was seldom asked, and he slighted the higher classes and oppressed the lower by heavy taxes and forced labor. Finally, the rape of Lucretia caused an outbreak. Tarquinius was deposed, and the monarchical government abolished in Rome. He made three attempts to reconquer his power by the aid of the people of Tarquinii, Porsena, and the Latins, but in vain, and died in wretchedness at Cumæ, 495 B.C.

Tar'ragon, an aromatic perennial composite herb (*Artemisia dracunculus*), native of N. Asia, but acclimated in European gardens, where, especially in France, it is cultivated for the young shoots used in the dressing of salads and for flavoring vinegar. Its leaves have a taste resembling anise. Tarragon vinegar is an article of commerce.

Tar'rytown, village, Westchester Co., N. Y.; on an expansion of the Hudson River known as the Tappan Sea; 25 m. N. of New York. It is one of the most attractive places for suburban residence on the Hudson; was the scene of the capture of Maj. André; and contains the Sunnyside home (2 m. S. of Tarrytown) and the burial place of Washington Irving, Sleepy Hollow, the Philipse manor house (erected in 1683), and a Dutch church (erected prior to 1699). Pop. (1900) 4,770; including N. Tarrytown, 9,011.

Tar'shish, the name of an ancient emporium known to the Hebrews. There are twenty-five or thirty references to it in the Old Testament. It was largely engaged in commerce, and probably in shipbuilding; it is several times spoken of as an island or sea coast; it had large traffic with Tyre and Sidon, especially in gold and silver, tin, iron, and lead; it is usually represented as W. of Palestine and of Tyre, and its ships are spoken of as broken by an E. wind. It has been variously identified with Tartessus in Spain, Tarsus in Cilicia, the island of Thasos, Carthage, etc. The claims of Tartessus are the best supported, in spite of some apparently contradictory expressions.

Tar'sus, town in Asia Minor, in the vilayet of Adana, on the Cydnus (*Tarsus Chaï*); the ancient metropolis of the Cilician confederation; then the capital of the Roman province of Cilicia, and for several centuries before and after Christ the most important city of Asia Minor as a seat of learning and center of commerce. Cleopatra, accompanied by Mark Antony, ascended the Cydnus to Tarsus in a gilded galley with purple sails and silver oars. Tarsus was the birthplace of Paul the apostle, and the burial place of Julian the Apostate. The city has greatly declined. The greater part of its former site is covered with débris; but it possesses one colossal ruin, an enigma to antiquarians, as it resembles no known edifice, and as its object has never been determined. This consists of two solid masses of concrete masonry; the larger 115 ft. long, 49 ft. wide, and 23½ ft. high; the smaller 56 ft. long, 39 ft. wide, and 23½ ft. high; the two inclosed in a rectangular space, 380 ft. long and 153 ft. wide, by a solid wall 21 ft. thick, and 23½ ft. high. Tarsus carries on much trade in cotton, sesame, wheat, maize, yellow wax, skins, carpets, tobacco, and raw materials. Pop. abt. 15,000, reduced in summer, on account of its unhealthiness, to 7,000.

Tarsus. See FOOT.

Tar'tan, a well-known species of cloth, checkered or cross barred with threads of various colors. It was originally made of wool or silk, and constituted the distinguishing badge of the Scottish Highland clans, each clan having its own peculiar pattern. An endless variety of fancy tartans are now manufactured, some of wool, others of silk; others of wool and cotton, or of silk and cotton.

Tar'tar, any salt of tartaric acid, more especially the acid potassium tartrate or hydrogen-potassium tartrate. See ARGOL.

Tartar, Cream of. See CREAM OF TARTAR.

Tartar Emet'ic, a double tartrate of potassium and antimony. It has a nauseous, metallic taste, and is a local irritant and powerful poison. Taken in small doses it promotes perspiration and reduces the pulse; causes nausea and vomiting, with relaxation of the bowels, and general weakness and depression, especially of the heart. In cases of tartar-emetic poisoning, tannic acid or strong tea should be given, and vomiting promoted.

Tartar'ic Ac'id, an acid with the chemical formula, $H_2C_4H_4O_6$, found free in various plants, berries, especially in grape juice from the cream of tartar (*q.v.*), of which the bulk of the commercial acid is derived. It crystallizes in transparent rhombic prisms, very soluble in water. Tartaric acid is extensively used in dyeing and in preparing effervescing drinks and baking powders. Some of the tartrates, such as tartar emetic, Rochelle salt, and the potassium-ferrous tartrate, possess valuable medicinal properties.

Tar'tars (properly TATARS), an ethnological name, used by some in a wider, by others in a narrower, and always in a vague, sense. The word *Tah-tar* was first applied to those Mongolian tribes which descended from the Altai plateaus to raid the Chinese lowlands. By Europeans the word was changed into *Tar-tar*, with an allusion to Tartarus, and was applied to all those tribes and races which Genghis Khan led into Europe, including Mongolian, Tungusian, and Turkish races. The name is used, especially by Russians, to designate certain populations speaking Turkish, living in Siberia, the Caucasus, and central and E. Russia.

Tar'tarus, used synonymously with *Hades* by the later Greek and Latin writers, but with Homer it means a separate place, as far below Hades as the heavens are above earth, into which Zeus had thrown the worst offenders. Later a distinction was made between Tartarus and the Elysian Fields as two divisions of Hades, the former occupied by the criminals, the latter simply inhabited by the dead. As a personification, Tartarus is represented as the son of Æther and Gæa (air and earth), and by his mother he was father to the Gigantes, Typhoëus, and Echidna. See HADES.

Tar'tary, a geographical name of vague and variable application. In the Middle Ages the name denoted the whole central part of E. Europe and Asia, from the Dnieper to the Sea of Japan. Later, a division into European and Asiatic Tartary took place, and the name of European Tartary was soon confined to the territory now called Crimea, while that of Asiatic Tartary first signified the whole empire of Genghis Khan and his successors, then Turkestan alone, with the exclusion of Turfan, Mongolia, and Manchuria, and now only that part of Turkestan, which does not belong either to Russia or to China.

Tar'trates. See TARTARIC ACID, CREAM OF TARTAR, TARTAR EMETIC, ROCHELLE SALT, etc.

Tashkend', capital of Russian Turkestan and chief town of Syr-Darya; the most populous city in central Asia; in a gently sloping, well-watered, fertile plain, covered with numerous fruit trees, at the foot of the Alatau and Chatkal Mountains. The city was formerly inclosed by a wall 7 m. long and pierced by nine gates, but this is now in a ruinous condition. There is a Russian citadel, with barracks and military stores, surrounded by a bastioned wall. A great caravansary forms the center of the wholesale business district. The Asiatic city has narrow, crooked, and ill-paved streets. Tashkend is one of the oldest and largest cities of central Asia, from old times the seat of an important agriculture and a brisk trade. The value of foreign goods exchanged in the city amounts to about $20,000,000 annually; the principal exports and imports are cotton fabrics, metal ware, and silk. The Arab geographers of the Middle Ages called the city Shash; from the sixteenth century to the eighteenth it was the capital of the Kirghiz Kosaks; in 1810 it was taken by the Khan of Khokan, and in 1867 it was occupied by the Russians. Pop. (1897) 156,506, of whom 75,000 are Sarts and 20,000 Russians, the remainder Uzbegs, Kirghiz, Jews, and other Asiatics.

Tasma'nia (formerly Van Diemen's Land), an island and British colony of Australasia; 150 m. S. of Victoria, Australia, from which it is separated by Bass Straits. It is the smallest and most healthful for Europeans of the seven Australasian colonies; area, 26,216 sq. m., about that of Greece. The discoverer, Tasman, named it Van Diemen's Land, but when the importation of convicts ceased, in 1853, it was renamed after the discoverer. The colony includes, with the island of Tasmania and the adjacent small islands, the Furneaux Archipelago, N. of the NE. angle, and consisting of Flinders Island (area, 800 sq. m.), Cape Barren Island, and others smaller; also King's Island, N. of the NW. point and about halfway to Australia (area, 425 sq. m.). The main island is well watered, picturesque, and varied, with high mountains and fine valleys, rocky and often precipitous coasts, and numerous rivers, cascades, and fresh-water lakes. It is sometimes called the Green Isle.

The coast is indented by many bays, estuaries, and well-protected ports.

The surface is rough and mountainous, and consists essentially of a central plateau, about 4,000 ft. above sea level. Cradle Mountain, in the W., is 5,069 ft. high; Frenchman's Cap, 4,760; Hugel Mountain, 4,700, and Mt. Bischoff, 2,500. In the E. the highest peak is Ben Lomond (5,020 ft.); in the S., Mt. Wellington (4,170 ft.) dominates Hobart. The streams are numerous. The longest rivers are the Tamar (150 m.), and the Derwent (140 m.). The latitude and insular character give Tasmania a temperate and genial climate. The autumn is the pleasantest season, with a mean temperature of about 57°. The mean annual temperature for Hobart for fifty years is 55°. The hot winds of Australia are much tempered by the passage of Bass Straits. Zymotic diseases are relatively rare.

The strata generally are very much contorted and tangled, and the density of the scrub vegetation has greatly impeded their investigation. Gold was discovered in 1852, and is generally distributed in the river sands and in the quartz rock, but Tasmania has an unimportant position among the Australasian colonies as a producer of gold. The value of the export in 1907 was £252,714. As a producer of tin she leads her sister colonies. It has hitherto been obtained almost exclusively from alluvial deposits, and is always in the form of cassiterite or tin oxide. The most celebrated mines are those of Mt. Bischoff, in the NW., and those of the Ringarooma district. Considerable areas of stream tin are worked out, and attention is turning to the lodes. The export in 1907 was valued at £516,927. Anthracite and bituminous coal are found, the latter in abundance. The silver-mining industry is developing rapidly, and silver to the value of £572,995 was exported in 1907. Copper is met with, but not in paying quantities. Iron is present in large quantities and in all varieties of ore. Hobart freestone is largely exported to the other colonies. A peculiar inflammable resinous mineral has been found in the Mersey district and named tasmanite.

The fauna is similar to that of Australia, but the Tasmanian wolf and Tasmanian devil are peculiar to Tasmania. A less favorable immigrant is the rabbit, which has become a pest here, as in Australia. The flora is similar to that of Victoria, but has many peculiar species. The celebrated blue gum, or *Eucalyptus globulus*, which has become a favorite immigrant in pestilential localities in America and Europe, flourishes best in the S. districts of Tasmania. Forests are abundant, and afford some woods of great value. The scrub is very thick and tangled. The evergreen forests are aromatic. There is a large timber trade. The soil is generally good, and some of the lower plains and valleys are marvelously fertile. The higher plateau is especially suited to stock raising. In 1907 there were 244,744 acres under crop and 432,128 acres under permanent artificially sown grass. Oats, potatoes, and hay are exported.

In 1907 the colony possessed 1,729,394 sheep and 215,523 cattle. It is singularly well adapted to sheep rearing, and its stud flocks are annually drawn on to improve the breed of sheep in the other colonies, but the industry is slowly decreasing. The wool clip in 1907 was estimated at 9,596,400 lb. The number of cattle and horses is increasing.

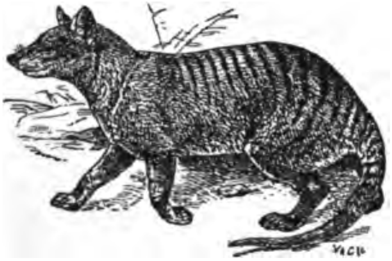
The aborigines were nearly allied to the native Australians, and in 1803 numbered about 5,000. Soon after arose the "Black War," in which they were nearly exterminated. In 1835 they were transported to Flinders Island, where they died out rapidly. The last representative of pure blood died in 1876. In 1891 there remained 139 half castes. In 1904 the population of the colony was 180,200, with a considerable surplus of males. The conditions for longevity are favorable, and the percentage of those over sixty-five years of age is 5.55, which is very high.

School attendance is compulsory. The chief imports are textiles, art and mechanical products, and foods and drinks. The trade is almost entirely with Great Britain or the other Australasian colonies.

The constitution became operative in 1886. The Parliament consists of a Legislative Council of eighteen elective members, holding office for six years, and of a House of Assembly of thirty-six members, elected for three years. All members of Parliament receive £50 a year, and have free passes on railways and franks in the post office and on the telegraph lines. The governor is appointed by the British crown, and has a cabinet of advisers of six responsible ministers. The public revenue is derived from taxation (58 per cent), mostly customs; from railway, postal, telegraph, and other public services (32 per cent); and from the rental and sale of public lands. In 1907–8 it was £1,004,309. The capital is Hobart; pop. (1901) 24,655. The next largest town is Launceston; pop. (1901) 18,077. Tasmania was discovered by Tasman, November 24, 1642, and first circumnavigated by Bass and Flinders in 1798. The first settlement was made from Sydney in 1803, and in the following year a penal colony was established at Hobart. There were several conflicts with the natives, and by 1825 the prosperity of the colony was seriously endangered from the number of escaped convicts who had taken to the bush and become brigands. Up to this time the colony had been subject to New S. Wales, but it was then made independent. A protest was made against the continuance of the importation of convicts, but this had to be repeated for nearly a generation before it was effective. Freedom of the press, trial by jury, and popular government were also gained only after long struggles. Although large numbers of criminals were transported to the colony from the beginning till 1853, the convict taint upon it was never so deep as on New S. Wales.

Tasman'ian Dev'il (so called from its fierce, untamable disposition), the *Dasyurus ursinus*, a carnivorous marsupial peculiar to Tasmania. It is about 20 in. long, exclusive of the tail, and dull black, with a white mark on the breast. The form is thickset, head large, teeth powerful. Before these animals were reduced in numbers they were very destructive to poultry, and even to sheep.

Tasmanian Wolf, Ze'bra Wolf, or **Thy'lacine,** the *Thylacinus cynocephalus*, a marsupial of doglike appearance, restricted to Tasmania. It is the largest of carnivorous marsupials, reaching a length of 4 ft. It has no marsupial bones, their place being taken by tendons. The color is grayish brown washed with yellowish, and there are about a dozen blackish crossbars on the hind part of the back. It was abundant, but has been nearly exterminated, owing to the havoc it wrought among sheep.



TASMANIAN WOLF.

Tass'o, Torquato, 1544-95; Italian poet; b. Sorrento. In 1562 he wrote his charming romantic poem "Rinaldo." In 1565 he went to Ferrara in the suite of Cardinal d'Este. His grave and melancholy beauty, eloquence, and varied accomplishments enlisted general admiration and endeared him to the duke's sisters Lucrezia, the future Duchess of Urbino, and Eleonora, who became known as the special object of his adoration. After about a year's residence in Paris, he was in 1572 formally attached to the court of Ferrara, before which his pastoral drama "Aminta" was performed in 1573 with splendor. In 1575 he completed his epic on the delivery of Jerusalem by Godfrey of Bouillon, under the title of "Il Goffredo," which was afterwards changed to "Gerusalemme liberata." He submitted it to Scipione Gonzaga, and was invited to enter the service of the Medici, enemies of the Estes. He declined, but ever afterwards fancied that Duke Alfonso had taken umbrage at his negotiation with them.

On returning to Ferrara he lived in perpetual fear, especially when he found his correspondence intercepted and his private papers purloined, with a view, he suspected, of giving the duke evidence of his relations with Eleonora. But the former long treated him with apparent forbearance, and even released him after a brief confinement for a murderous assault said to have been committed by him in a frantic fit upon Lucrezia's servant, and permitted him to retire to a convent (1577). Tasso, however, fled to his sister's house at Sorrento, whence he was allowed to return in 1578 on condition of remaining under medical treatment. His renewed attempt (1579) to regain the favor of the Ferrara court subjected him to new indignities, for resenting which he was committed to the hospital of Santa Anna. Despite the death of Eleonora in 1581, he lingered in confinement till 1586, when he was released on condition of remaining in charge of Duke William of Mantua, who showed him much kindness. For the rest of his life he almost continually traveled from Naples to Rome and from Rome to Naples, and finally lived in a charitable asylum in Rome until the Grand Duke of Tuscany enabled him in 1590 to visit Florence. In 1593 appeared his "Gerusalemme conquistata," a remodeled form of his first epic, to which he alone regarded it as superior. In 1594 Pope Clement VII invited him to come to Rome to be crowned with laurel in the Capitol, but he died before the solemnity took place.

Taste, one of the five senses. The glossopharyngeal nerve is regarded as the principal channel by which taste impressions are conducted from the tongue to the brain. The exact seat of the sense of taste is in the "taste buds," which are a closely compacted group of cells set around the large papillæ at the back of the tongue. To be tasted, substances must be dissolved. There are four principal tastes: sweet, bitter, acid, and salty. Sweet tastes are best appreciated by the tip, acid by the side, and bitter tastes by the back of the tongue. Flavors are really odors. Taste is affected by very high or very low temperature. By chewing the leaves of an Indian plant (*Gymnema sylvestre*) the power of tasting bitters and sweets may be lost, while the taste for acids and salts remains. The sense of taste may be greatly refined by conscious practice, as in the case of professional wine and tea tasters, to whom flavors entirely inappreciable to the ordinary palate are clearly distinct. See SENSE; SENSATION; TONGUE.

Ta'tars. See TARTARS.

Tate, Nahum, 1652-1715; English poet; b. Dublin; went to London; became poet laureate, 1692, and died in the precincts of the Mint, a privileged place for debtors. He is chiefly remembered by his version of the Psalms, made in conjunction with Brady, which is still retained in the "Book of Common Prayer"; assisted Haydn in writing "Absalom and Achitophel," and perpetuated a one-time popular stage version of Shakespeare's "King Lear."

Tat'tersall's, Knightsbridge Green, London, is the greatest metropolitan mart for horses and headquarters of the turf, removed in 1865 from Grosvenor Place, where it was established by Richard Tattersall in 1773. A subscription room is open for bettors on the turf, where they make and settle their bets.

Tattoo'ing, the practice of marking the skin by means of slight punctures or incisions into which pigments are introduced. In the S. Pacific the custom was originally almost universal, although now dying out. Tattooing is also found among the Burmese, Laos, Japanese, and American Indians; in Japan, however, the practice has been forbidden by the government, and is disappearing. With the races of darker color, such as negroes, Malays, and the natives of Australia a more prevalent method of ornamenting the skin is by simple scars. The tattooing of a few emblems on the arms or body is a custom with sailors and the lower-class population of Europe. With the Polynesians and Japanese, however, the figures cover nearly the whole body, and largely take the place of clothing. A peculiarity of the Maoris was the elaborate tattooing of the face; many of their heads are preserved in museums. The art of tattooing was brought to its most artistic development in Japan.

Taun'ton, capital of Bristol Co., Mass.; on the Taunton River; 33 m. S. of Boston. It was called Cohannet by the Indians; the first purchase of ground by the whites was in 1637; incorporated in 1639, and had a city government in 1865. It is in an agricultural region, and in 1900 had 284 factories, representing seventy-five industries, including cotton machinery, cotton cloth and yarn, metal goods, silverware, oilcloth, fire and building brick, and jewelry. Pop. (1905) est. at 30,967.

Tauch'nitz, Karl Christoph Traugott, 1761–1836; German publisher; b. at Grossbardau, Saxony; learned printing at Leipzig; worked for some time in Unger's establishment in Berlin, and opened in 1796 a printing house in Leipzig, to which were added in 1798 a book store, in 1800 a type foundry, and in 1816 the first stereotype foundry in Germany. From his establishment were issued the celebrated editions of Greek and Latin authors, which in correctness, convenience, and cheapness surpassed all other editions which had hitherto appeared.

Taurida (tä̆'rĭ-dă), government of Russia, bordering on the Dnieper, the Black Sea, and the Sea of Azov; area, 23,312 sq. m. It consists of the peninsula of the Crimea and districts of the mainland. The inhabitants are Tartars, who feed cattle and sheep on the steppes and cultivate wheat and millet. Pop. (1907) 1,663,300.

Tau'rus, range of mountains in Asia Minor, stretching E. to W. from the Euphrates to the Gulf of Adalia. By the Alma-Dagh it communicates with the Lebanon Mountains, in Syria, and by one branch of the Anti-Taurus with the Caucasian Mountains. It rises in terraces from the Mediterranean to 10,000 ft., and incloses between itself and Anti-Taurus an elevated plain, arid, dotted with salt lakes. Highest peak, the Aidost, 11,680 ft.

Taurus ("the bull"), a brilliant constellation which may be seen S. of the zenith during the evenings of December and January. It includes the Pleiades and Hyades and the red star Aldebaran. Taurus is the second sign of the Zodiac. See ZODIAC.

TAURUS.

Taxa'tion, the system by which revenue is raised to meet the general expenses of a government whether national or local. A direct tax is levied upon the persons who are to pay it, as a poll tax; an indirect tax is levied in such manner that the person paying it can recoup himself, as in customs duties, when the duty is added to the selling price of the goods.

In his "Wealth of Nations" Adam Smith laid down four canons of taxation: (1) The subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities—that is, in proportion to the revenue which they respectively enjoy under the protection of the state. (2) The tax which each individual is bound to pay ought to be certain, and not arbitrary. (3) Every tax ought to be levied at the time or in the manner in which it is most likely to be convenient for the contributor to pay it. (4) Every tax ought to be so contrived as both to take out and keep out of the pockets of the people as little as possible over and above what it brings into the treasury of the state. As the French financier Colbert cynically put it, taxation is the art of so plucking the goose as to secure the largest amount of feathers with the least amount of squealing.

(1) Taxes should be assessed on things rather than on persons—on the property itself rather than on its owners. (2) In conformity with this rule, an income tax should be levied at the sources of the income rather than on the receivers of the income. Of course this complicates the possibility of levying compensatory or progressive income taxes, and may bear hard upon people with small incomes; but the evasions which result from a violation of this rule do far more harm than the hardships which result from conformity to it. (3) No deductions from the value of property should be made on account of debt. Mortgaged real estate, for instance, should be assessed at its full value. Under the present system, which allows deduction for debt, a large part of the money lent on real estate wholly escapes taxation. The present system puts burdens, first, on the holder of unmortgaged real estate, who has to pay a higher rate of tax because the valuation of the town where he lives is lower; second, on the widows and orphans, who pay a high tax rate on their investments, while other investors conceal the fact of their holdings. Its benefit to the holder of mortgaged real estate is largely illusory, because the existence of the present system keeps the rate of interest higher than would otherwise be the case. The only man who gets much benefit is the lender, who enjoys the high rate of interest and makes no tax return. (4) The same principle should be applied to corporations. The value of the corporate

property is represented by the market value of its stock and debt. This debt can be reached by taxing the corporation either on its gross earnings, its net earnings, or its securities as a whole. It cannot be reached by an attempt to tax it in the hands of the holders. (5) To secure an equitable land tax, real estate should be assessed on the basis of its price rather than of its productiveness; unimproved real estate should be assessed higher and improvements relatively lower than at present. The assessors to-day see that the man who holds unimproved real estate gets little income, and they let him off easily on account of his supposed inability to pay a high tax. The real effect of this is to take burdens off the shoulders of a man who is waiting for the growth of the community to make him rich and to put those burdens on the shoulders of those who are contributing to that growth. Whatever may be thought of Henry George's single-tax theory as a whole, there can be little question that a relatively higher assessment of ground rent, with corresponding relief for those who have made improvements, is a much-needed reform. (6) The objects of national, state, and local taxation should be separated as far as possible. See EXCISE; INCOME TAX; INHERITANCE TAX; REVENUE; SINGLE TAX; TARIFF.

Tax'idermy, the art of preserving the skins of animals and replacing the flesh by some durable material, so as to represent life. It differs from embalming, which seeks to preserve the flesh itself. The skin of the animal must be carefully removed, cleaned, and poisoned, preferably with some preparation of arsenic, as arsenical soap or powder. The skin of most mammals must be so tanned that the hair will not fall out, and so that the skin may dry hard and stiff to retain the form given it. Wires or irons are placed in the legs to sustain the weight, and around these the original shape of the legs is built up in tow, or tow and excelsior. On the care with which this is done depends much of the appearance of the finished work, and in the case of quadrupeds thinly clad with hair great pains are needed to bring out the muscles. The leg irons are attached to a central wire, board, or body of excelsior, according to the size of the animal or method to be followed, and in birds and small mammals the neck and body are made together, and little remains to be done in the way of further filling. The easiest, but worst, method is after the skin has been drawn over the legs, and they have been attached to the body, to fill out the skin with tow or straw, working out the principal muscles from within. The best method, with quadrupeds of any size, is to build up over a wooden framework the entire shape of the body, including the neck, replacing the muscles by excelsior and tow, smearing this manikin over with clay or plaster to attain smoothness. The finer details about the eyes, lips, and nostrils are reproduced by placing a layer of plaster beneath the skin and working in the lines and other characters. Birds are preserved readily; mammals are more difficult; the smooth, glossy skin of cetaceans defies the taxidermist, and can only be imitated by a carefully made cast, and the same is true of the large majority of reptiles and fishes, although with care many may be mounted.

Taxon'omy, that department of biological science which deals with the arrangement and classification of animals and plants.

Tax Sales, public official sales of land made in pursuance of law for nonpayment of taxes which have been laid upon them. Power to make such sales is entirely statutory, and is not derived from any rule of the common law, the right of a government to grant such power being a necessary attribute of its sovereignty. The power when granted is a naked power, and not one coupled with an interest, and the statutes giving it must be strictly construed. To make a valid title under a tax sale, all the formalities prescribed by the statute must be observed. The land must be listed and assessed, not be exempt, and proper steps taken to collect the tax, a tender of the amount of which will invalidate the sale. Due notice of public sale must be given, and the right of redemption is liberally construed.

Tay, river and loch of Perthshire, Scotland. The river, which is the largest in Scotland, rises on the border of Argyleshire, and is called the Fillan until it passes through Loch Dochart, 8 or 9 m.; and thence to Loch Tay, 10 m. farther, it is generally known as the Dochart. Near Loch Tay it receives the Lochie, and below that loch the Lyon and other tributaries. It is nearly 120 m. long, describes almost a semicircle to Perth, and flows thence nearly E. to the North Sea through the Frith of Tay. Its salmon fisheries are celebrated. Loch Tay is 16 m. long, 1 m. wide, and 600 ft. deep.

Tay'lor, Bayard, 1825-78; American traveler and author; b. Kennett Square, Pa.; apprenticed to a printer; published his first volume, "Ximena and other Poems," 1844; made a pedestrian tour in Europe, and published "Views Afoot, or Europe Seen with Knapsack and Staff"; in 1847 joined the staff of the New York *Tribune*, with which he was connected while he lived, publishing in that journal originally the substance of most of his works of travel. In 1849 he visited California; 1851, Egypt, Asia Minor, Syria, and Europe; 1852-53, crossed India from Bombay to Calcutta, going thence to Hongkong, and joining Perry's expedition to Japan. In 1862-63 he was secretary of legation, and for a while *chargé d'affaires* at St. Petersburg. He resided at intervals several years in Germany, and from 1872 he was engaged upon a biography of Goethe and Schiller, which he left unfinished. His books of travel include "El Dorado," "Journey to Central Africa," "The Lands of the Saracen," "Visit to India, China, and Japan," "Northern Travel," "Travels in Greece and Russia," "Colorado," "Byways of Europe," and "Egypt and Iceland." He wrote four novels, including "The Story of Kenneth," which is autobiographical, and many volumes of poems, his best-known verse being "The Bedouin's Love Song"; and translated into the original meters both parts of Goethe's "Faust" (1870-71), which is his most important literary work. He lectured extensively in the U. S. He was appointed U. S. minister to Germany in 1877.

Taylor, Jeremy, 1613–67; English theologian; b. Cambridge, England; 1626, entered Caius College as a sizar; gained the friendship of Bishop Laud, and in 1636 obtained a fellowship at Oxford; in 1638 was presented to the rectory of Uppingham. In the civil wars he adhered to the cause of Charles I, who made him his chaplain; but his rectory was sequestered by Parliament, and he fled to Wales, where he supported himself by teaching a school and wrote his noblest works; was several times imprisoned for his royalist sentiments, and in 1658 took up his residence in Ireland. In 1660 he signed the royalist declaration of April 24th, which paved the way for the restoration of Charles II. Soon after the Restoration he was made Bishop of Down and Connor. As a preacher and writer, he occupies a foremost rank in literature. Besides his "Sermons," his principal works are "Discourse on the Liberty of Prophesying," setting forth the iniquity of persecution for differences in opinions, by some held to be the ablest of all his works; "The Great Exemplar of Sanctity and Holy Life," a life of Christ; "The Rule and Exercise of Holy Living," "The Rule and Exercise of Holy Dying," "Ductor Dubitantium," a work on casuistry.

Taylor, Zachary, 1784–1850; twelfth President of the U. S.; b. Orange Co., Va. He became lieutenant in the U. S. army, 1808; captain in 1810. In 1812 he was in command of Fort Harrison, near the present site of Terre Haute, on the Wabash River, and in September with fifty men repulsed an attack by a large force of Indians. For this he received the first brevet (as major) ever given in the U. S. service. In 1814, with the rank of major, he commanded an expedition against the British and Indians on Rock River. He was employed for several years on the NW. frontier and in the S. In 1819 he became lieutenant colonel, and in 1832 colonel, and was engaged in the Black Hawk War. On December 25, 1837, he defeated the Seminoles in the battle of Okechobee, and was breveted brigadier general; and in April, 1838, he was commander in chief in Florida. In 1840 he was in command of the first department of the army in the SW. Congress having, March, 1845, passed the joint resolution annexing Texas, Gen. Taylor was directed to defend it against invasion from Mexico.

Early in 1846, with 4,000 troops, he marched to the Rio Grande, opposite Matamoros, and erected Fort Brown. Arista, the Mexican commander, crossed the Rio Grande with 6,000 men, and, on May 8th, attacked and was defeated by Gen. Taylor with 2,300 men at Palo Alto, a few miles from Matamoros. The Mexicans retreated to Resaca de la Palma, and the next day again gave battle to the Americans, who after a severe contest drove them across the Rio Grande. The total loss of the Mexicans in these battles amounted to about 1,000 men. Taylor was made a major general. May 18th he entered Matamoros, and in September, with 6,625 men, he marched against Monterey, which was defended by Gen. Ampudia with 10,000. After several days' desperate fighting, Ampudia capitulated. On February 22, 1847, Gen. Taylor with about 5,000 men was attacked at Buena Vista by Santa Anna with 21,000. The Mexicans were signally defeated, and "Old Rough and Ready," as he was called in the army, became a household word. In 1848, Gen. Taylor was nominated as the Whig candidate for President of the U. S. over Clay, Scott, and Webster, with Millard Fillmore for Vice President. They received 163 electoral votes, against 127 for Cass and Butler. In the midst of violent discussions excited by the proposition to admit California as a free state, and other measures affecting slavery, upon which the President's recommendations had deeply offended the S. leaders, he died of bilious fever sixteen months after his inauguration. One of his daughters married Jefferson Davis. His son Richard was an officer in the Confederate states army.

Tchad (formerly CHAD or TSAD), a large, shallow African lake, full of islands, but fluctuating in size with the season; in central Sudan, on the S. margin of the Sahara Desert, in a military district of its own name in the French Kongo. The waters are fresh, though it has no outlet. The elevation is 1,150 ft. above the sea, and the area varies from 10,000 to 50,000 sq. m. Its principal tributaries are the great Shari River, the Komadugu, and the Bahr-el-Ghazal.

Tchookchees′, a tribe inhabiting the NE. corner of Siberia, and of the same family as the Eskimos of N. America.

Tea, (1) the prepared leaves of a plant of the genus *Thea,* and specifically of the *T. chinensis*; (2) the plant itself; and (3) an infusion of the leaves of the tea plant, widely used as a beverage. It is probable that all tea owes its origin to Assam, a province of Burma. There in the jungle bordering on the Brahmaputra were found thickets of indigenous tea trees, often attaining 30 ft. It has been claimed that indigenous tea exists in China and Japan; but it is probable that the plant was introduced into China from India 1,500 years ago, and into Japan from China not later than the ninth century. Tea was introduced into Europe by the Dutch about the beginning of the seventeenth century. The tea made from the Assam leaf is strong, often pungent and rasping; it is half again as strong as the Chinese.

The Chinese plant is of bushy growth and of far less attractive appearance than its Assamese relative. It is tough and hardy, enduring the severe winters of the higher latitudes of China and Japan or of the elevated gardens on the Himalayan slopes. It survives deficiencies in moisture, soil, and cultivation, but gratefully acknowledges care and enrichment with an improved growth and higher leaf qualities. Under ordinary agricultural conditions it annually produces only four or five flushes or crops of leaves. The leaf is smaller, tougher, and darker. It yields when properly prepared a more delicate if weaker tea than the Assamese. Unfortunately the very conditions conducive to its best growth create the worst malarial disorders among Europeans and those from other temperate climates. "Fever and tea go together." Cultivated tea is raised from seed. The plant produces small white flowers, which one year later yield from one to four seeds about half the size of the American chestnut. At the end of the young shoot is an undeveloped bud, which is of all the new foliage the tenderest and choicest. It is called the pekoe tip, or flowery pekoe when made into tea. Mandarin tea is prepared from it in China; the tips are slightly rolled and dried, and finally tied up with ribbons in tiny bunches, like cigars. Except as a curiosity one does not see this tea outside of China, as in that country it commands a very high price. The next leaves are called the orange pekoe and pekoe. They, with the tip, yield pekoe tea, especially esteemed for strength and flavor. When not fermented, but prepared as green tea from the half-opened leaves in April, it is known as young hyson, hyson being a corruption of the Chinese "yu tsien," meaning "before the rains." Most pekoe teas are sent to Great Britain and Russia.

Tea Plant.

In this order of enumeration, from the pekoe tip downward, the size of the leaf increases, but the quality falls off. The finer the picking, *i.e.*, the more strictly it is confined to the bud and smaller leaves, the better is the quality, but the more expensive and curtailed is the crop. Genuine green teas are the result of quickly drying the fresh leaf, whereas black teas are subjected to oxidation before being "fired," as the drying of the moist leaf is called. The most important chemical difference between the simply dried tea leaves (*i.e.*, green) and the fermented (*i.e.*, black) lies in the less amount of tannin in the latter. For black tea the fresh leaf is thinly spread out to wither. It is then rolled; then the balls or mass of rolled leaf are broken up, spread out thinly, moistened, and are subjected to oxidation, whereby tea loses its raw smell and acquires a fine flavor. This constitutes the most critical operation in the whole process, there being no fixed rules to determine its length and intensity. The effect of oxidation is chemical, the chief change being a loss in astringency, induced by a diminution of the tannin; the tea also becomes darker in color. After the rolled leaf is broken it is fired in iron vessels over charcoal fires. The thoroughly dried and brittle tea should be packed while hot in metallic cases, and hermetically sealed to exclude moisture.

The annual crop of tea in China has been estimated at from 400,000,000 to 2,000,000,000 lb., of which about 250,000,000 is exported. The Chinese cultivate the tea plant in small gardens, or in outlying corners or on steep hillsides where no other crop can be raised. The farmer often sells his crop on the bushes, as oranges are sold in Florida.

Japanese teas are almost wholly green. The leaf is not adapted for black tea. Steam withering is practiced to reduce the raw flavor. The general finish is very elegant, but artificial coloring and facing are common. The green color is given by dusting it with Prussian blue at the time of roasting. The most esteemed brand of Japanese tea is called *tencha* or flat tea, because it is not rolled; indeed, it is claimed that it is not touched by hand after being put on the steaming apparatus. It commands a high price in Japan. Such teas are finely ground shortly before use, and after stirring with warm (not boiling) water for a few minutes, the whole infusion is drunk. They play an important part in the ceremonial tea drinking—a curious feature of Japanese political history and social life. Tea production in the British Indies is on a large scale. Wealthy corporations or individuals cultivate hundreds or thousands of acres, employing great capital and immense numbers of laborers. The operations in the field are performed under the piece system and in a thoroughly systematic manner. In the factory, the simplification of processes and the substitution of machinery for manual labor have reduced the cost of manufacture, and resulted in the production of a more uniform and cleaner article.

The chief active ingredient of tea, upon which depends most of its influence, is the alkaloid theine, which is practically identical with caffeine derived from coffee. Tea leaves contain from one half to six per cent of theine, with from twelve to eighteen per cent of tannic acid (which gives overdrawn and boiled tea its bitter taste) and an aromatic volatile oil. Tea stimulates brain and spinal cord; it quickens thought so that a mild condition of "nervousness" is produced which prevents sleep. Tea retards tissue waste. Strong tea is a useful antidote in poisoning by opium or antimony, as it combats the depression of heart and lungs induced by opium, and forms an insoluble compound with antimony which delays its absorption.

Teak, a forest tree, *Tectona grandis*, of the *Verbenaceæ*, of India and Farther India. It is the best timber known for shipbuilding, as it resists water and insects. It is more durable than oak, more easily seasoned, equally strong, considerably lighter, and far more easily worked. It is used for making decks and planking, for the keel, timbers, and even masts and spars. Many all-teak ships are reported to be over one hundred years old, and still sea-worthy. The wood resembles mahogany. The flowers and leaves have medicinal qualities, and are used in dyeing. African teak, the wood of a euphorbiaceous tree, resembles true teak, but it much inferior to it.

Teak.

Teal, any one of several small ducks having a rather narrow bill but little longer than the foot. The wing bears a conspicuous mark, or speculum, of blue or metallic green. They are birds of rapid flight, partial to fresh water, and their flesh is excellent food.

Teal.

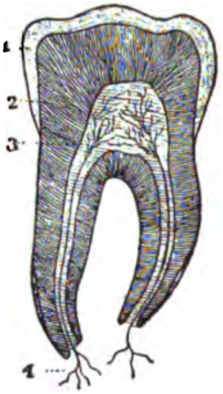
Tea, Paraguay′. See Mate.

Technol′ogy, a general name for industrial science. Strictly, there is no such science, but all the sciences contribute much that is of value to the various industries; and technology is the teaching of those parts of science which are of direct industrial importance.

Tecum′seh, or Tecumtha, 1768–1813; chief of the Shawnee Indians. Abt. 1805 he and his brother Elskwatawa, who had set up as a prophet, attempted to unite the W. tribes to resist the whites. In 1811, during Tecumseh's absence in the South, Gen. Harrison marched on the prophet's town. The prophet attacked him, and was defeated at Tippecanoe, November 7th. This disconcerted Tecumseh's plans and broke the spell of the prophet's power. When war was declared with England, Tecumseh appeared in Canada, served in the action on the Raisin, and after being wounded at Maguaga was made a brigadier general in the British forces. He was in command with Proctor at the siege of Fort Meigs, and saved American prisoners from massacre. He commanded the right wing at the battle of the Thames, and fought desperately till he was killed.

Te Deum (tē dē′ŭm), the most famous non-biblical hymn of the Western Church, dating from the fifth century, named from its opening phrase, "Te Deum laudamus" ("We praise thee, O God!"). Its authorship is unknown. Besides its use in the morning service, it is used as a special service of thanksgiving after great victories and at coronations.

Teeth, the organs in vertebrates for the seizure and mastication of food, placed at or near the entrance to the alimentary canal. In adult man there are thirty-two, sixteen in each jaw, implanted in sockets, and of an irregular conoid form; in the child, previous to the second dentition, there are only twenty. The number of the teeth increases in the lower animals, being greatest in the cetaceans and marsupials among mammals, and also considerable in many reptiles and fishes. The portion of a tooth above the socket is called the crown, the concealed part the root or fang; between these there is a more or less marked constriction or neck. In vertebrate animals the teeth, like the bones, have for their earthy basis phosphate of lime, mingled with some carbonate of lime and fluoride of calcium, the latter being chiefly in the enamel.



Enlarged Vertical Section of a Tooth. *1*, enamel; *2*, dentine; *3*, pulp; *4*, blood vessels and nerves.

A tooth is composed of dentine, *crusta petrosa*, and enamel. The dentine, forming the greater part of the body of the tooth, is firm, transparent, and nearly homogeneous, composed of about seventy-two per cent of calcareous and twenty-eight per cent of organic matter. It is permeated throughout by minute cylindrical channels, called *canaliculi*, about $\frac{1}{12000}$ in. in diameter, which radiate from a central or pulp cavity. The pulp is the only portion of the tooth which is supplied with blood vessels and nerves. The *crusta petrosa* is a thin layer of bony tissue attached to the outside of the dentine in the fang of the tooth, and serving to connect it, by means of its periosteum, more firmly to the socket. The enamel, which covers the surface of the crown of the tooth, is much the hardest of its tissues, containing often over ninety-five per cent of calcareous matter.

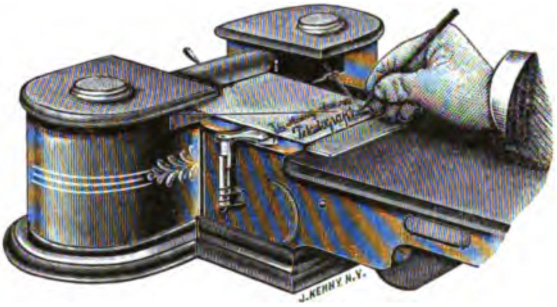
In man there are in each jaw four incisors or cutting teeth; next to these, on each side, is a canine tooth, those of the upper jaw being called eye teeth; next to these are two bicuspids, and then three molars, making sixteen teeth in each jaw. The last molar is known as the wisdom tooth, as it appears much later than the others. The temporary, or milk teeth, consist of ten in each jaw, four incisors, two canines, and four molars. They usually begin to appear at seven months, and are complete when the child is two years old. See DENTISTRY.

Tegucigalpa (tā-gō-sē-gäl′pä), capital (since 1880) and largest city of Honduras; in a plain or basin surrounded by mountains, 3,250 ft. above the sea; 60 m. from its port of Amapala, on the Gulf of Fonseca. It is in the most thickly populated region of the republic, is the center of a fertile agricultural district, and has mines of gold and silver. The most conspicuous building is the cathedral; the president's palace and other public edifices are unpretentious. The climate is mild and salubrious. Pop. (1905) 34,692. Tegucigalpa is the capital of a department of the same name, having an area of 3,475 sq. m. and a pop. (1901) of 81,800.

Teheran′, capital of Persia; province of Irak-Ajmi, 70 m. S. of the Caspian Sea; in a sandy and stony plain at the S. foot of the Elburz Mountains, which rise here, in Mt. Demavend, to 18,600 ft. The streets for the most part are narrow, crooked, ill paved, and filthy, and the houses low and insignificant, generally built of mud, although there are some modern boulevards and houses in Western style. Some mosques, bazaars, and caravansaries are handsome structures, however, and the palace of the shah, forming a city by itself, is vast and elegant. Teheran became the residence of the shah in 1796. It has some manufactures of carpets, cotton and linen goods, shoes and hats. Its population varies much from winter to summer, as the shah and the wealthier citizens leave it early in spring on account of the heat and unhealthful atmosphere. Pop. 280,000. In the vicinity are the ruins of Rei, the *Rhages* of Scripture, the ancient capital of Parthia and the birthplace of Harun al Raschid.

Tehuantepec (tā-wän-tā-pĕk′), **Isth′mus of,** a constriction of the American continent, in SE. Mexico, between the Bay of Campeche (Gulf of Mexico) on the N., and the Gulf of Tehuantepec, an arm of the Pacific, on the S. Its width, in the narrowest part, is 134 m. The mountain chains, on reaching the isthmus, are suddenly depressed, with several passes below 700 ft. There have been many projects for a canal across this neck, and careful surveys, one by the U. S. Govt., have been made. Some of the reports are favorable, but the work would be enormously expensive. A railway from Coatzacoalcos on the N. to Salina Cruz on the S. now runs across the isthmus; it was constructed by the Mexican Govt. and it was opened 1894. As long ago as 1847 the U. S. Govt. endeavored, without results, to procure a right of way over the same route. Physically, the Isthmus of Tehuantepec separates Mexico from Central America, the land E. of it, with Yucatan, belonging rather with the latter than with the former region.

Telau′tograph, name given by Elisha Gray to an instrument invented by him by which autographic messages can be transmitted electrically. The mechanism consists of a transmitting and receiving instrument, with two conducting wires, and by its use handwriting, drawings, etc., are instantly reproduced at the receiving point in facsimile. The message or drawing is produced with an ordinary lead pencil, near the point of which two cords are fastened at right angles with each other. These cords connect with the mechanism of the transmitter, and, following the motion of the pencil, produce positive and negative electrical impulses through the action of a permanently magnetized steel gear wheel, the teeth of which induce pulsations as they pass by an electromagnet. The receiving mechanism at the terminus of the conducting wire is driven by an electric motor operated by a local battery. The pulsations, as they arrive, control an escapement wheel, driven by the motor, which moves the writing lever in exact unison with the pencil of the transmitter. The movements of the pencil of the writer are reproduced by the shifting of a friction wheel driven by two disks, one of which gives it an advance and the other a retrograde movement, dependent upon the wheel being brought into contact with one or the other of the two disks. The receiving pen is a capillary glass tube supplied with ink from a reservoir. The pen, passing over the paper, leaves a facsimile of the sender's motions. The writing is made and reproduced on continuous strips of paper 5 in. in width. As each line is completed the movement of a lever advances the paper the proper distance for the beginning of a new line. The same operation brings the two instruments into unison in case of discrepancy in their movements. Satisfactory tests of the practical working of the telautograph have been made between Chicago and Cleveland, and London and Paris.



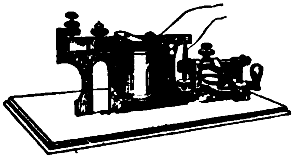
THE TELAUTOGRAPH (transmitting instrument).

Tel′egraph (from Greek *τηλε*, far, + *γράφειν*, write), any apparatus or process for conveying intelligence to a distance other than by voice or writing. The idea of speed is included, the telegraph being employed only to transmit intelligence more quickly than can be done by ordinary means.

As soon as it became known that electricity could be conducted by wires to a distance, it began to be regarded as a possible means of conveying intelligence.

Experiments were made by many persons, both in the U. S. and abroad, and these culminated in the demonstration of the feasibility of transmitting signals by a current of electricity through insulated wire by Joseph Henry in Albany, N. Y. Samuel F. B. Morse, of New York, in 1832 conceived the idea of making signs at a distance by means of a pencil moved by an electro-magnet and a single conducting circuit, the paper being moved under the pencil by clockwork. He constructed a working model of his invention in 1836, and exhibited it in 1837. Several years were devoted by Morse and his associate, Alfred Vail, to improving the invention. In 1844 the first public line was completed between Washington and Baltimore (40 m.), and the first message transmitted May 27th of that year. Soon lines were extended to the principal cities of the U. S. The Morse telegraph was introduced into Germany in 1847, whence it has spread all over the E. hemisphere, and now is the universal telegraph of the world.

Experiments in submarine telegraphy followed. In 1842 Morse laid a cable between Castle Garden and Governor's Island, in New York, and obtained results that demonstrated the practicability of submarine telegraphy. In 1850 an experimental line was laid across the English Channel. This success suggested the laying of a cable across the Atlantic Ocean. In 1854 the attention of Cyrus W. Field, of New York, was directed to the subject, and mainly through his efforts a company was formed to undertake the enterprise. The first attempt was made in August, 1857, but it was unsuccessful, the cable parting 300 m. from shore. The following year the attempt was renewed and the work successfully completed August 5, 1858. Communications were exchanged until September 1st, when the cable failed altogether. In 1866 a new cable was successfully laid, being landed at Newfoundland, in perfect working order, July 27, 1866. The British Pacific cable, the first to cross the Pacific Ocean, connecting Vancouver, B. C., with Sydney, Australia, was completed in 1902, and the cable joining San Francisco with Manila, via Hawaii and Guam, in 1903.

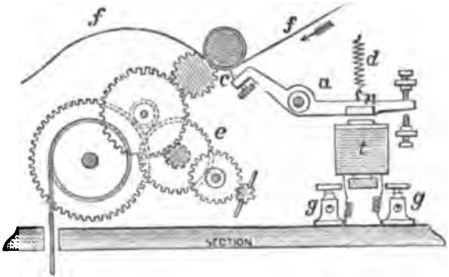


Telegraph Instrument.

All electric telegraphs may be said to consist of three parts: first, an apparatus for generating or producing the electric current; second, a conductor for conveying the electricity from one point to another as required; and, third, apparatus for transmitting and receiving the signals.

The electricity used in telegraphy may be derived either from the voltaic battery, the magneto-electric machine, or the thermoelectric battery. Of these, the voltaic battery has been the most commonly used, though much has been done in developing the capacity of the dynamo-electric machine, which in most large stations has successfully replaced the voltaic system. Conductors are usually carried through the air, but when required may be placed under ground or under water. In either case they must be well insulated with nonconducting materials.

The apparatus used in telegraphy may be conveniently divided into recording and nonrecording. Of each of these there are several varieties, but the most important is the recording telegraph that bears the name of Morse.

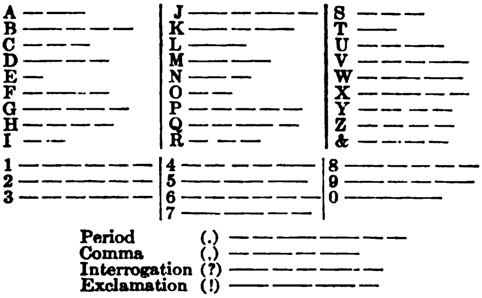


Telegraphic Register.

Its characteristic feature is the *register*, which is constructed on the general principle shown in the diagram. A horizontal lever is mounted upon a fulcrum, *a*, and armed at one end with a steel point, *c*, projecting upward and nearly touching a ribbon of paper, *f*, which is carried along at a uniform rate by a grooved roller just above it, the roller being impelled by a system of clockwork, *e*. The opposite end of the lever carries a soft iron armature, *n*, suspended just above the poles of an electro-magnet, *t*. The end of the wire helix surrounding this magnet terminates in binding screws, *g g*, to which the conducting wires are attached. A current of electricity traversing the helix of the electro-magnet causes it to become powerfully magnetic, attracting the armature, *n*, to its poles, and thus pressing the steel point, *c*, against the paper ribbon moving above it upon the grooved roller. A continuous line will in this manner be embossed upon the paper as long as the armature remains attached to the poles of the magnet. When the current is interrupted, the magnetism disappears, and the spring, *d*, draws the marking point away from the paper. Thus the length of the line embossed upon the paper corresponds to the greater or less length of time that the electric current is allowed to traverse the helix of the electro-magnet, *t*. This is governed by the transmitting instrument termed the key, which is simply a small horizontal lever with a finger knob at one end and a spring beneath. The wire leading from the line is connected to this lever, and when the latter is depressed by the finger of the operator it comes in contact with a metallic stud, known as the anvil, to which the battery wire is attached; thus the circuit is completed, and the current permitted to flow into the line.

When the latter is but a few miles long, the battery and key are connected directly by a wire with the electro-magnet of the register; but when the distance is greater, an instrument called the *relay* is employed. This consists of an electro-magnet with a lever mounted like that of a register, except that the marking point is replaced by a contact point, which opens and closes the circuit of a local battery, and this in turn operates the register. A considerable number of relays with their registers may be placed at as many different points upon the same line, and all operated simultaneously by a key at any point. This is the arrangement usually adopted in the U. S. The line or main batteries are usually placed at the two ends of the route, though each station has, of course, its local battery of one or two cells. The alphabetical code consists of arbitrary characters composed of combinations of short lines termed dots and longer ones termed dashes, separated by varying spaces. The following is the alphabetical code used in the U. S., Canada, Mexico, and Central America:

THE AMERICAN TELEGRAPHIC ALPHABET.


A
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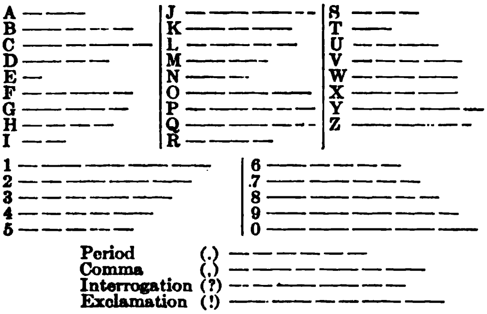
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
&
1
2
3
4
5
6
7
8
9
0
Period (.)
Comma (,)
Interrogation (?)
Exclamation (!)

In all other parts of the world the *international telegraph alphabet* is used, as follows:


A
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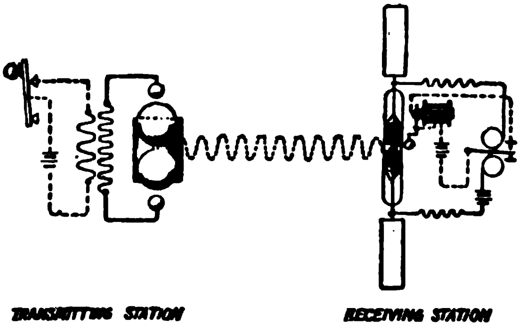
V
W
X
Y
Z
1
2
3
4
5
6
7
8
9
0
Period (.)
Comma (,)
Interrogation (?)
Exclamation (!)

Of the nonrecording telegraphs the most important is the sounder, which is simply a Morse register stripped of all its parts except the electro-magnet, writing lever, and retracting spring. The operator interprets the sounds made by the motion of the lever up and down between its stops. This method was taken up by operators in the U. S. abt. 1848, and the sounder has now almost entirely superseded the recording apparatus in the U. S. and Canada, as experience proves that the speed of transmission is practically doubled, while the proportion of errors is largely diminished. The operator reads from the instrument, and simultaneously copies the message. For military purposes the sounder, together with a manipulating key, is often reduced in size, so as to be contained in a pocket case not larger than a tobacco box and weighing but a few ounces, and yet forming a completely equipped Morse telegraph station, which may be connected with a line at any required point. See CABLE.

Teleg'raphy, Wire'less, a name now restricted to telegraphy by means of electro-magnetic ("Hertzian") waves, although at first used to include telegraphy by induction, by earth conduction, and by other methods that have not yet reached the commercial stage. Electro-magnetic waves were treated theoretically by Clerk-Maxwell, the English physicist, over thirty years ago, but their actual existence was first demonstrated by Heinrich Hertz, of Karlsruhe, Germany. He devised means for generating them by an oscillating electrostatic discharge (the "oscillator") and for receiving and detecting them; but these instruments were not delicate enough to transmit and receive intelligible messages. The first patent on an electric-wave telegraph was granted in England to William Marconi, an Italian inventor, in 1896. In the same year he exhibited his apparatus at Toynbee Hall, London. His receiver was essentially the "coherer" of Sir Oliver Lodge, based on the "radioconductor" discovered in France by Brauly in 1890. This depends on the fact that a mass of fine metal particles, such as iron filings, becomes a conductor when an electric wave passes it, because the particles then adhere. The particles will fall apart when the wave has passed if they receive a slight mechanical shock. Marconi's first receiver consisted of such a coherer, with a tapping device to "decohere" the particles and a device to detect the passage of a current in the circuit of which the coherer formed a part. The whole was connected with an "antenna" or aërial wire. On striking this, the wave "cohered" the filings, completed the circuit, and made an appropriate signal which was at once broken off by the action of the decoherer. At the sending station a Hertz oscillator was used with an induction coil, the wave being started by a spark sent across a gap one side of which was connected with an "antenna" and the other with the earth.

This is the simplest wireless-telegraph system. Improvements on it have been generally either to increase the sending distance, or so to adjust the sending and receiving instruments that only messages intended for the latter will affect it. The sending distance has now been extended to several thousand miles. Wireless messages are sent across the Atlantic and between warships in different parts of the world; but the efforts to adjust the sender and receiver so as to exclude outside messages, and to send messages that other apparatus cannot receive, have not been so successful. Most of them have been based on the early experiments of Sir Oliver Lodge, who introduced induction coils and condensers into his circuits in such a way that the receiver would respond only to waves between certain limits of length. Such devices are now included in all the modern systems, but their object has not been completely attained, since the electric waves used are not sufficiently regular and continuous.

In the most recent Marconi system, a new form of receiver is used in which the electric wave disturbs the magnetic condition of a metallic band in a glass tube on which primary and secondary coils are wound, inducing in these currents that are detected by means of a telephone. In the Lodge-Muirhead system a "buzzer" for regulating the frequency is included in the transmitting apparatus, and the receptor uses a rotating mercurial coherer in conjunction with a siphon recorder. The Fessenden system has an electrolytic detector consisting of a fine platinum wire, one end of which is plunged in an acid solution in a platinum vessel. The De Forest system discards the direct current with induction coil, and uses instead an alternating current with a "step-up" transformer, which charges a battery of Leyden jars. The detector is a small crystal of carborundum. In Germany two systems, known as the Braun-Siemens and the Slaby-Arco, have combined to form the "Telefunken" system, which still uses the old coherer, with nickel and silver filings, as a detector.



Marconi's Apparatus.

An effort to produce waves that are sufficiently regular and lasting to make perfect "tuning" possible, and so bring about the adjustment of sending and receiving instruments that have been imperfectly realized hitherto, has been made by Valdemar Poulsen, a Dane. He does away altogether with the electric spark as a wave generator, and uses instead a "singing" arc lamp, whose frequency he increases to several millions a second by placing an alcohol lamp under the arc. The waves thus obtained are, it is claimed, continuous and regular, being comparable to a musical note, while those due to a spark are more like an explosive noise. Ordinary forms of detector may be used and experiments appear to indicate that, with the new form of wave, exact "tuning" may be carried out; but the system is not yet in the commercial stage.

The chief use of wireless telegraphy so far has been at sea, or between vessels at sea and coast stations, much greater sending distances being possible over water than where mountains and other obstacles intervene. Nearly all large liners and warships are now equipped with the necessary apparatus, and by its means often keep in communication with land during voyages of many days' extent. On October 7, 1907, a regular transatlantic service was established between stations at Clifden, Ireland, and Glace Bay, Nova Scotia.

Telem'achus, in Greek mythology, son of Odysseus and Penelope. He was an infant when his father joined in the war against Troy. After the termination of the war, he sailed out, accompanied by Athene in the shape of Mentor, and visited Pylos, Sparta, and other places, to learn the fate of his father; and on his return to Ithaca he found Odysseus living there in disguise with the swineherd, Eumæus. A recognition took place, and he then aided Odysseus in slaying the suitors and clearing the house of its burdensome guests. His voyage forms the subject of Fénelon's "Télémaque."

Telep'athy, thought transference, or the phenomenon of the reception by the mind of an impression not traceable to any of the recognized channels of sense, and assumed to be due to an influence from the mind of another person, near or remote. Thus the sphere of telepathy is not the same as that of *clairvoyance*, in which it is assumed that the mind of the subject may receive an impression of *impersonal facts*, or things at a distance. The subject who receives the impression is called the percipient, the one from whom the influence emanates is usually called the agent, in accounts of experiments on this phenomenon. In the earlier works on animal magnetism there are many reports concerning subjects who are said to have developed the power of obeying the silent commands of the hypnotizer.

More recently there have been public exhibitors of "mind reading," and their performances have been imitated in private circles by the so-called willing game. In most of these feats the agent is required to think intently of some act while he lays his hands on some part of the so-called mind reader's person. The mind reader, either promptly or hesitatingly, will then usually perform the act. It is safe to assume that, wherever such personal contact between the pair is allowed, the percipient is guided by the encouragement or checking which the agent's hands more or less unconsciously exert upon his at first tentative movements; so that muscle reading, and not mind reading, is the proper name for this phenomenon. The strongest evidence for thought transference is given by the sittings of certain "test mediums," of which the best worked-out case is that of Mrs. Piper, published in the Society for Psychical Research "Proceedings" for 1890, 1892, 1895. This lady shows a profuse intimacy, not so much with the actual passing thoughts of her sitters, as with the whole reservoir of their memory or potential thinking.

Telepathy has been used as a theory to explain "veridical hallucinations" such as would be the apparition of a person at a distance at the time of his death. The theory is that one who is dying or passing through some crisis is for some unknown reason peculiarly able to serve as "agent" and project an impression, and that the telepathic "impact" in such a case produces hallucination. Stated thus boldly the theory sounds most fanciful, but it rests on certain actual analogies. Thus a suggestion made to a suitable subject in the hypnotic trance that at a certain appointed time after his awakening he shall see the operator or other designated person enter the room will take effect and be followed by an exteriorized apparition of the person named. Moreover, strange as the fact may appear, there seems evidence, small in amount but good in quality, that one may, by exerting one's will to that effect, cause oneself to appear present to a person at a distance. As many as eight persons worthy of confidence have recently reported successes in this sort of experiment. The whole subject, however, is still in its infancy so far as definite observation goes.

Tel'ephone, a word applied by Wheatstone in 1840 to the rod and string telephones (as they are now called), in which sound vibrations are transmitted from one point to another by means of a rod or tightly stretched string connecting two elastic diaphragms of membrane, wood, or other suitable material. In strictness, the word telephone still refers to the acoustic as well as the electric telephone, but the latter, on account of its universal use, is the instrument to which the term is usually applied.

As early as 1854 a suggestion as to the possibility of transmitting speech by means of electricity was made by Charles Bourseul in Paris, France, and in 1861 in Frankfort, Germany, Philipp Reis published an account of his experiments on the same subject. Reis endeavored to secure the transmission of speech by a circuit-breaking operation. For a transmitter he employed a membrane to which was fastened a flexible strip of metal connected with one terminal of a voltaic battery. The receiver used consisted of a long helix of insulated wire wound about a knitting needle, the whole being mounted upon a sounding box. When the receiver was connected in circuit with the transmitter and a battery, and the transmitter was operated, the alternate makes and breaks of the current produced by the intermittent contact between the metallic strip and point of the transmitter caused a sound to issue from the receiver. This sound necessarily corresponded in pitch with that spoken into the transmitter.

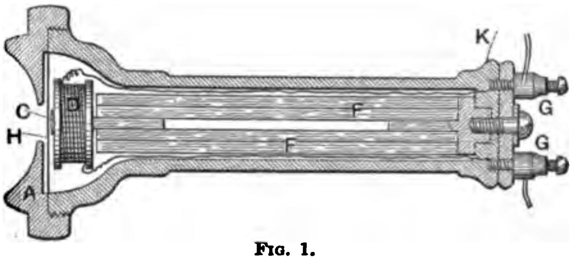


FIG. 1.

A method by which the quality of sounds, including those of articulate speech, can be reproduced with an apparatus as previously suggested was invented by Alexander Graham Bell and patented on March 7, 1876. His method consists in the production and utilization of electrical undulations similar in form to the vibrations of the air of the sound waves. The electrical condition of the line particles and the vibration of the receiver are controlled, not intermittently, at the end of each complete vibration, but throughout the whole duration and extent of this vibration. To do this the transmitting instrument must produce in the line an electrical current which possesses a variation in strength from instant to instant, similar to the corresponding changes in the density of the air in the sound waves which actuate the transmitter, in which case the electrical changes will copy the air waves, so to speak, and the varying electrical current will be represented graphically by substantially the same curve that represents the air waves. By the action of this undulatory current upon a suitable receiver it will reproduce at the receiving end of the line air waves which are similar in form to the electrical variations, and hence to the sound waves actuating the transmitter. The original apparatus devised by Bell was a form of what is called a "magneto telephone." In the improved instrument, which has chiefly been used in the U. S., the transmitter and receiver are alike, and are shown in Fig. 1. F F is a compound bar magnet, with a soft-iron pole piece, C, around which is wound a coil of insulated wire, D, whose terminals run to the binding posts, G G. H is a circular diaphragm of thin iron, held at its edge between the case of the instrument, K, and the mouthpiece, A. When used as a transmitter the instrument is put in circuit with a second one at the farther end of the line, which serves as a receiver. The operation is as follows: When the soft-iron diaphragm, H, is spoken to, it takes up the motions of the particles of air and vibrates in accordance with these motions, and so moves toward and away from the magnetized pole piece periodically with a velocity varying from instant to instant, according to the characteristic form of the air waves. Since these possess all the characteristics impressed upon the electrical current by the vibrations of the diaphragm of the transmitter, the receiver will give out a sound similar to that uttered into the transmitter. The telephone just described has been universally employed as a receiver. As a transmitter, however, it was soon superseded by a more powerful apparatus, called the microphone, which depends upon the following principle for its success: It had been known for a long time that when an electric current passed from one conductor to another through a "loose contact"—that is, when the contact surfaces, or electrodes, rested only very lightly upon one another—there was at the joint a resistance to the electrical flow, which was lessened when the pressure was increased. The Blake transmitter was invented by Francis Blake, and introduced into public use in

1878. Its construction is shown in Fig. 2. D is a diaphragm of sheet iron, against which rests lightly a small platinum button, K, which is suspended by a light leaf spring, A. Around a button of hard carbon, C, is spun a brass weight, W. A rather stiff spring, S, sustains W and C. A and S are insulated from each other at their upper ends. K and W are the hammer and anvil electrodes, respectively, of the microphone. A current from a battery, B, passes through the joint between the two electrodes. When the diaphragm enters into vibration under the action of the voice it pushes the hammer electrode, K, into more or less intimate contact with the anvil electrode, C. The inertia of C, weighted as it is by W, keeps the anvil electrode from jumping away from the hammer electrode, and the spring S holds the two electrodes in proper position as regards the diaphragm. The varying pressure between K and C causes a corresponding variation in the strength of the current to take place, so that when a magneto receiver is put in circuit with the transmitter speech is reproduced. The proper normal pressure between the electrodes is secured by means of the bent lever, L, and adjusting screw, N.

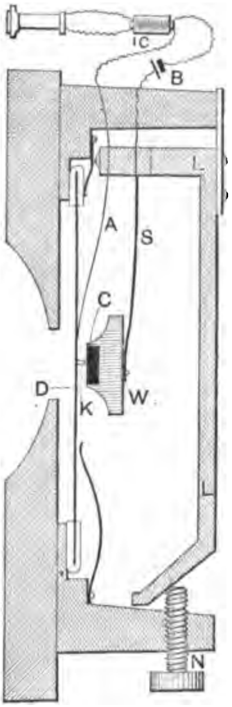
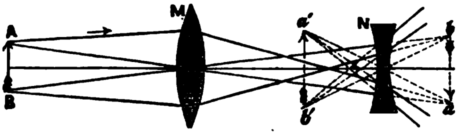


Fig. 2.

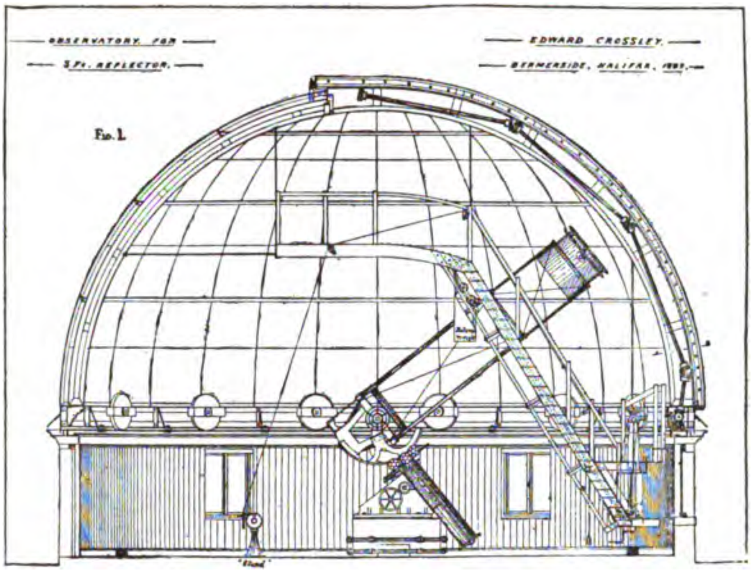
The development of the art of telephony has necessitated the invention of a large number of special contrivances for local and long-distance transmission. For long-distance transmission complete metallic circuits are employed rather than the grounded circuits usual in telegraphy, and such lines are also far more satisfactory for local business on account of their greater freedom from electrical disturbances.

Wireless Telephony.—Considerable progress has been made in telephony by means of electro-magnetic waves. Phonograph music has been transmitted from Berlin to Copenhagen by Poulsen, and the system devised in this country by Fessenden has been used between Brant Rock and Plymouth, Mass., a distance of 11 m., with success. Radio-telephones have also been installed on ships of war, and the art is in about the same stage of development as was wireless telegraphy ten years ago. The telephone is called to control the Hertzian waves at the transmitting apparatus by the insertion of a microphone in the condenser shunt circuit, whose action molds the waves, as it were, into speech forms. In the receiving apparatus an electrolytic detector may be used, which, when properly coupled to the antenna and condensers, varies in resistance according to the variation in amplitude of the incident waves.

Tel'escope, an optical instrument for increasing the apparent magnitude and intensity of distant objects, or the size of their images on the retina. The essential parts of the instrument are two in number: a mirror or combination of lenses for bringing the rays of light which emanate from each point of the distant object to a focus, thus forming an image of the object, and an ocular for viewing this image. A refracting telescope is one in which the rays of light are made to converge to the focus by a system of lenses; a reflecting telescope is one in which they are made to converge by being reflected from the surface of a slightly concave polished reflector. Telescopes were first made in Holland, about the year 1608, when Hans Lipperhey applied for a patent for such an instrument. Apparently an attempt was made by the Dutch authorities to have the invention kept secret. The first telescopes were, of course, very imperfect instruments, the object glass consisting only of a single small lens. It does not seem that the Dutch inventors attempted to apply the instrument to any important purpose. This was first done by Galileo in 1610, who, having heard of it, reasoned out the principles on which it ought to be constructed. Galilean telescopes consisted of an object glass and a concave eyepiece, the latter being placed inside the focus. This form is still used in opera glasses, but does not admit of a high power being obtained with distinctness. Galileo, however, was able with this imperfect instrument to see the phases of Venus and the satellites of Jupiter, making the discoveries which have made his name immortal. The great difficulty encountered by the astronomers of the seventeenth century arose from the fact that the different rays of colored light are unequal in length, and hence do not meet at the same focus. This deviation of the foci is called chromatic aberration of the telescope. It was found that this defect could be diminished by increasing the focal length, but then the instrument would soon become unmanageable. This led to the invention of the reflecting telescope, in which no such defect exists. The latter instrument underwent gradual improvement from the time of Newton to that of Herschel, a hundred years later, who brought it to great perfection. Meanwhile Chester More Hall, of England, about 1733, invented a combination of crown lenses and flint lenses, which would in great part correct not only the chromatic, but also the spherical aberration, which is the deviation of rays of light due to the imperfect focusing of the lens. The invention was brought

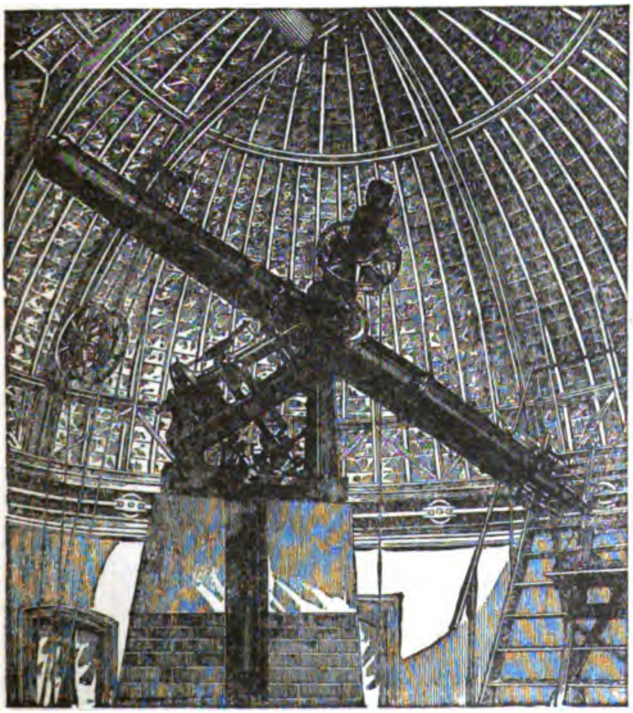


Galileo's Telescope. *M*, mirror; *N*, ocular; *a b*, object.



Reflecting Telescope at the Lick Observatory.

into practical use by Dollond, of London, whose telescope acquired great celebrity during the latter half of the eighteenth century; but their size was only what is now considered the smallest. Up to 1800 it was thought almost impossible to make a good disk of flint glass of more than 4 or 5 in. in diameter. The difficulty was that the great density of the lead which is a component of the flint glass caused the lower part of the pot of glass to be denser than the upper part. By skill and attention glass makers learned how to obviate this difficulty, so that early in the nineteenth century disks of 8 or 10 in. became common, and before the middle of the century they were carried to 15 in. The difficulty then was on the part of the optician to grind the lenses of this size so perfect in figure that they would bring all the rays to the same focus. The greatest artisan in this respect during the first half of the century was Fraunhofer, of Germany. The first person to improve upon his work was Alvan Clark, of Cambridgeport, Mass. About 1846 he began to experiment in grinding lenses, and by 1853 had attained such success that a glass of nearly 8 in. diameter was purchased from him by Rev. R. Dawes, who found that Mr. Clark's glass was superior to any that he had been able to obtain elsewhere—a conclusion which established the reputation of the maker. He and his two sons continued to make larger and larger instruments, as orders were given, until his work culminated in the grinding of the 36-in. telescope of the Lick Observatory and that of his son Alvan G. in the Yerkes telescope, of Chicago, 40 in. in diameter. The principal refracting telescopes of the world are the Yerkes, at Geneva Lake, Wis., which has an object glass 40 in. in diameter, and a focal length of 64 ft.; the Lick, at Mt. Hamilton, Cal., with an object glass 36 in. in diameter and a focal length of 58 ft.; the two instruments at Meudon, France, which have lenses 32 and 24 in. in diameter, and the telescope at the Imperial Observatory at Pulkowa, Russia, where the object glass is 30 in. in diameter. For many years the largest reflecting telescope in the world was that built in 1844 by Lord Rosse at Birr Castle, Ireland. The mirror was of speculum



A Refracting Telescope at the Lick Observatory.

metal and was 72 in. in diameter. It failed to yield the expected returns, and no instruments with large mirrors were again built until 1891, when A. A. Common erected in Ealing, England, a telescope in which the mirror was of silver on glass, and was 60 in. in diameter. In the U. S. valuable results have been obtained with the 24-in. mirror at the Yerkes Observatory and with the 36-in. Crossley reflector at the Lick, on Mt. Hamilton. In 1908 there was completed by G. W. Ritchey a 60-in. mirror for the Soar Observatory, Mt. Wilson, Cal., and in 1906 the Carnegie Institute, of Washington, ordered for the same observatory a 100-in. mirror for a reflecting telescope of 50 ft. focal length. See BINOCULAR TELESCOPE; FIELD GLASS.

Tell, William, legendary hero of Switzerland. According to tradition, he was a hunter living in Bürgelen, in the canton of Uri. His wife was a daughter of Walter Fürst, who with Stauffacher and Melcthal organized the conspiracy of the Grütli in 1307, and founded Swiss independence. Tell's part in the revolt against Austria is related as follows: Gessler, Austrian bailiff in Küssnacht, placed his cap upon a pole in the market place at Altorf, commanding passers-by to do it reverence. Tell neglected or refused to do this, and was sentenced to death. But as he was a skillful marksman, Gessler offered to spare his life on condition of his shooting an apple from his boy's head. Tell succeeded without injuring the child. Gessler perceived that he possessed a second arrow, and asked the object. Tell replied: "To kill you if I had harmed my son." He was again put in chains, and Gessler embarked for Küssnacht, taking Tell with him. The boat being overtaken by a storm, Gessler released Tell to steer it; and as they neared the present "Tell's Rock," or "Tell's Leap," Tell sprang ashore, went around by land, and, lying in ambush between Brunnen (where Gessler safely landed) and Küssnacht, wounded him mortally with an arrow. A general uprising took place, the Austrian bailiffs were expelled, and their castles destroyed. In 1315 Tell served in the battle of Morgarten, and in 1354 was drowned while trying to save a boy's life. Such is the story as told in old chronicles and songs and as dramatized by Schiller. But recent historical investigations have shown it to lack a historical foundation, although the legend is common among the nations of Aryan race, and is found in the Persian poet Fared Udden Attâr, the Icelandic sagas, and the English song on William of Cloudesley.

Tellu'rium, one of the rarest elements, resembling sulphur and selenium. Its compounds, such as gold and silver tellurides, are found in N. America and Europe. Tellurium is silver white, brittle, and lustrous.

Tem'pe, a valley, or gorge, in NE. Thessaly, Greece; 5 m. long, and in some places so narrow that there is space only for the river Peneus, which traverses the valley, and a carriage road. In antiquity it was celebrated for its beauty. The ruins of its fortifications are still visible.

Tem'perament, an old popular classification of the general temper or disposition of a person. There were four temperaments: choleric, sanguine, phlegmatic, and melancholic.

Tem'perance. See ABSTINENCE, TOTAL; PROHIBITION.

Tem'perature, the condition of a body in relation to molecular activity manifested as heat, which determines its interchange, either by giving off or by absorption, with neighboring bodies. See HEAT.

Temperature of the Bod'y. The temperature of the human adult in health averages from 98.4° to 98.6° F., the fractionally higher temperature existing in the warmer-blooded races, as those of S. Europe, the lower average being found in N. nations and the Anglo-Saxon race. The fluctuations of temperature in health are exceedingly small—fractions of a degree, rarely more—dependent on physical activity or inactivity in sleep or wakefulness, or functional activity, as digestion. The regulation of the production and dissipation of heat is controlled by nervous centers in the brain. Any disturbance of these by conditions of the blood or circulation may therefore lead to disturbances of the temperature. "Shock," or nervous depression, causes reduced temperature, while excitement, pleasure, anger accelerate the circulation and elevate temperature. The temperature of children and infants is one to two degrees higher than that of adults. The temperature of aged persons is half a degree or more below the adult average.

In many diseases there is elevation of temperature. Where this is but a symptom in some distinct local disease the fever is regarded as but a symptom; but there are diseases in which the fever is the most decided symptom. These have long been known as the fevers, or the infectious fevers. Among such are typhoid, malarial fever, and the like. In these there is usually a period of onset, a stage of continued symptoms, and a stage of decline. The temperature of the body varies greatly in different cases of the same fever or other disease and at different times. This may depend either upon the individual or upon the severity of the disease. As a rule, its range is from 101° to 105° F. When above the latter point the term hyperpyrexia is applied. Such may occur, especially in pernicious malarial fever, in sunstroke, and in certain cases of rheumatism. In the last-named diseases temperatures of 110° or 112° F. have been noted where recovery ensued. Occasionally cases of elevation of the temperature to 118° or 120° or even more are recorded; but in many of these deception has been practiced. The reverse of fever, subnormal temperature, is also frequent. Moderate grades are noted in conditions of depression or shock. It reaches serious grades in collapse from injury or such diseases as cholera. The external temperature may here sink to 90° or even to 85° F. In practice the temperature is usually taken in the axilla, or mouth, though the rectal temperature is less liable to accidental errors of observation. See ANIMAL HEAT; FEVER.

Tem'pering, in metallurgy, the process of giving to metals, principally iron and steel, the requisite degree of hardness or softness, especially the process of giving to steel the necessary hardness for cutting, stamping, and other purposes. If heated and suddenly cooled below a certain degree, it becomes as soft as iron; if heated beyond that degree, it becomes very hard and brittle. The process essentially consists in plunging the steel when red hot into cold water or other liquid to give an excess of hardness, and then gradually reheating it until the hardness is reduced or brought down to the required degree. The excellence of all cutting steel instruments depends on the degree of temper given to them.

Tem'plars, Knights. See KNIGHTS TEMPLARS.

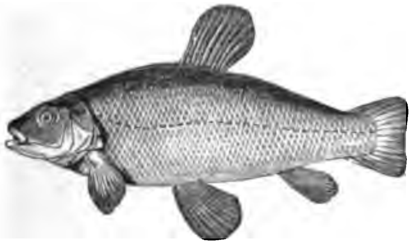
Tem'ple, Sir William, 1628-99; English statesman. In 1665 he was sent on a secret mission to the Bishop of Münster, created a baronet, and appointed resident at Brussels. In 1667 he visited Holland, and in 1668 concluded the triple alliance of England, Holland, and Sweden against France. He went as ambassador to The Hague in 1668, was recalled in 1671, and returned thither in 1674. In 1679-80 he was a member of the Privy Council of Charles II, and thenceforth lived in retirement. His works (edited by Swift) comprise "Observations upon the United Provinces of the Netherlands," essays on the "Origin and Nature of Government," "Ancient and Modern Learning," "Gardening," etc.

Temple, The. See JERUSALEM.

Tem'po (time), in music, the comparative speed at which a composition is to be played. This is usually indicated by certain words—as lento, largo, or adagio (slowly), andante (moderately), allegro (lively), allegretto (a little slower than allegro), presto (quickly). A more exact method is to use a metronome.

Tem'poral Pow'er. See PAPAL STATES.

Tench, a fish, abundant in European streams and lakes, of dark greenish-olive color above and on the sides, and lighter below. Sometimes it attains a length of 3 ft., and weighs 12 lb., but usually weighs below 3 lb. Its flesh is insipid.



COMMON TENCH.

Ten'der, in law, the attempt to perform a promise to do something or to pay something. The tender must be made by the promiser, or by one duly acting on his behalf, to the promisee or his duly authorized representative; it must be of the kind and must be made at the time and place stipulated in the contract or fixed by law, and it must be unconditional. The effect of a rejected tender to pay money is somewhat different from that of a rejected tender of goods. In the latter case the seller is discharged by his tender, "and may either maintain or defend successfully an action for the breach of the contract." In the U. S., the tender, although rejected, vests title to the goods in the purchaser. Such is not the effect in England, unless the buyer has previously assented to the appropriation of the goods to the contract by the seller.

A tender of money in performance of a promise does not discharge the debt. It does, however, if kept good, stop interest and entitle the tenderer to costs, if he is sued upon the contract. The money must be of a kind declared by law to be tenderable. The U. S. Constitution (Art. 1, Sec. 10, cl. 1) provides that no state shall make anything but gold and silver a tender in payment of debts; and U. S. gold coins are a legal tender to any extent; also silver dollars, except when otherwise expressly stipulated in the contract; also U. S. notes; while silver certificates are tenderable for customs, taxes, and public dues, and silver coins below the dollar are tenderable in sums not exceeding $10, and other minor coins for an amount not exceeding twenty-five cents. Silver coins are tenderable although worn smooth by wear, as are gold coins unless reduced one half of one per cent below standard weight.

Ten'don, in anatomy, the name of a white fibrous tissue connecting the end of a muscle with the bone which it is intended to move.

Tenerife', the largest of the Canary Islands; area, 780 sq. m. The coasts are rocky and wild, and afford only one good harbor, Santa Cruz de Santiago. The interior is mountainous, and in the center is the volcano, Pico de Teyde (12,182 ft.). The middle region is clad with beautiful forests, and the foot, as well as the hills and valleys, is covered with vineyards, olive and almond groves, wheat fields, and orchards. Prior to 1853 the average annual yield of wine was 25,000 pipes, but the grape disease appeared, and the yield fell to 8,000 pipes. Land previously devoted to vineyards was given up to the cultivation of the cochineal insect, and it became the chief product. Pop. (1900) 138,008. Capital town, Santa Cruz de Santiago (or de Tenerife).

Teniers, David, the younger, 1610-90; Flemish painter; b. Antwerp; studied under his father, but the influence of Rubens and Adrian Brouwer is recognizable in his work. His works were extremely popular, and he became wealthy and distinguished. Archduke Leopold William, the Governor of the Spanish Netherlands, appointed him to be his court painter and chamberlain. Teniers bought an estate at Perck, between Antwerp and Mechlin, whither people of distinction went to visit him; removed to Brussels in 1647. This artist is well represented in all European collections. He painted rapidly, and produced hundreds of genre pictures, also some landscapes. The father's signature seems to have been a T within a D, while the son wrote his name D. Teniers F.

Tennessee', the Big Bend State, one of the U. S. of N. America, the third state admitted into the Union; bounded N. by Kentucky and Virginia, E. by N. Carolina, S. by Georgia, Alabama, and Mississippi; W. by Arkansas and Missouri; length, E. to W., 432 m.; breadth, N. to S., 109 m.; area, 42,050 sq. m. Pop. (1908) 2,220,000. The E. third of the state is hilly, the middle undulating, and the W. low and level. There are eight natural divisions: (1) The Unaka Range on the E. border, comprising wooded mountain ridges with spurs and fertile intervening coves; also lofty peaks with treeless summits covered with luxuriant grasses, and having the flora of Canada and the climate of New England; area, 2,000 sq. m. (2) The valley of E. Tennessee, a fluted region of parallel ridges and narrow valleys, extending NE. to SW. through the E. part of the state; elevation, 1,000 ft.; area, 9,200 sq. m. (3) Next, on the W., the Cumberland Table-land, or level top of the Cumberland Mountains, which rise abruptly 1,000 ft. above the valley of E. Tennessee and 2,000 ft. above the sea; surface shows low ridges and shallow valleys; much of it is covered with native grasses; summers are cool and climate healthful; area, 5,100 sq. m. (4) The Highland Rim bounds the table-land on the W., and, extending on the N. and S., as far W. as the Tennessee valley, incloses the Central Basin; elevation, 1,000 ft.; has numerous mineral springs and many summer resorts; area, 9,300 sq. m. (5) The Central Basin, a depression of 5,450 sq. m., resembles the bed of a drained lake with its main slope to the NW.; greatest diameter from NE. to SW., 120 m.; altitude, 550 ft. (6) The W. valley of the Tennessee River embraces 1,200 sq. m. of river lowlands and valleys extending into the highlands; 360 ft. above the sea; reaches across the state from N. to S.; breadth, 10 to 12 m. (7) Adjoining this is the plateau slope of W. Tennessee, descending to the Mississippi; surface slightly undulating, streams sluggish; W. border terminates abruptly with steep hills which overlook the Mississippi bottoms; average elevation, 500 ft.; area, 8,850 sq. m. (8) The alluvial Mississippi bottoms are low and level, with swamps and lakes, abounding in fish and wild fowl; elevation above the gulf, 295 ft.; area, 950 sq. m.

THE GREAT SEAL OF THE STATE OF TENNESSEE
AGRICULTURE
COMMERCE
1796

The Clinch, Powell's, and Holston rivers drain upper E. Tennessee; the French Broad, Little Tennessee, and Hiwassee assist, lower down; and the Tennessee, formed by the union of the two forks of the Holston, carries all this water into Alabama, thence back N. across Tennessee and Kentucky into the Ohio. The Cumberland pours into the Ohio the drainage of N. Middle Tennessee; the Duck, the Elk, and Caney Fork drain the rest of this section; and the Obion, Forked Deer, Big Hatchie, and Wolf carry most of the W. Tennessee waters into the Mississippi. The principal rivers are the Mississippi, the Cumberland, and the Tennessee. The only lakes are in the Mississippi bottoms, and are little more than expansions of small rivers. Reelfoot, between Lake and Obion cos., is the most noted; it was largely produced by the earthquake of 1811–12.

The principal mineral products are bituminous coal and iron. The marble industry is growing. Zinc, copper, lead, mineral paint, and limestone are increasing sources of revenue, and other mineral riches abound. The rich limestone soils of the Central Basin make it the garden spot of the state, although the richest soil is the black loam of the Mississippi bottoms. Cotton, corn, and general crops are produced in luxuriance. The principal crops are: corn, wheat, hay, tobacco, and oats.

The average annual mean temperature is 59°. Though in summer and winter marked extremes are sometimes reached, yet these seasons are generally mild, and spring and autumn are delightfully temperate and pleasant. A limited amount of snow falls. There are three recognized political divisions: E., Middle, and W. Tennessee, and much local feeling exists among these as to the apportionment of offices, etc. Principal cities and towns are: Memphis, Nashville, Knoxville, Chattanooga, Jackson, Clarksville, Columbia, Bristol, part in Tennessee. The latest census reports 8,007 factories, including seventeen cotton and fifty-one woolen mills. Flour, lumber, leather, cotton seed, and tobacco are important sources of revenue. The most notable educational institutions are the Univ. of Tennessee at Knoxville; Vanderbilt Univ. and Univ. of Nashville at Nashville, Univ. of the South at Sewanee, Cumberland Univ. at Lebanon, Southwest Presbyterian Univ. at Clarksville and Southwest Baptist Univ. at Jackson, and Fisk Univ. at Nashville. In 1907 the public elementary schools had 488,564 enrolled pupils, with 9,521 teachers. The public high schools had 308 teachers and 7,165 pupils.

In 1541 the Spaniards under De Soto touched Tennessee where Memphis now stands. Here the French under La Salle, 1682, built a fort, and the Spaniards afterwards erected San Fernando. The country was claimed by the Spanish, the French, and the English. Charleville, coming up from Louisiana in 1714, built a trading house near the present Nashville, and

French and English struggled to secure the Indian trade. In 1748 Dr. Thomas Walker, with other Virginians, discovered the Cumberland Mountains, Gap, and River, which he named for the Duke of Cumberland. Fort Loudon, the first Anglo-Saxon outpost in the wilderness, was built by Andrew Lewis in 1756. It was taken by the Indians, 1760. The tide of migration was from Virginia and the Carolinas. First came hunters, explorers, and traders, followed, in 1769, by immigrants who settled on the Watauga. In 1772 the first government, the Watauga Association, was formed. The Revolutionary War found the settlements patriotic. Shelby and Sevier led 500 men into the Carolinas in 1780, where they defeated the British Ferguson at King's Mountain. On his return, Sevier made a conquest of the Cherokee Indians. After the Revolution, N. Carolina ceded the territory to the Federal Government, and left the inhabitants without law or protection. Therefore in 1784 the State of Franklin was formed, and, though the parent state at once reversed her act of cession, lasted till 1788. The final cession, however, was made in 1790, and the "Territory South of the Ohio River" was formed. Knoxville was laid out in 1792.

In 1796 the state was admitted into the Union. The first two decades of the nineteenth century were characterized by rapid growth and contests with the Indians. The first bank (the Nashville) was chartered in 1807. Memphis was laid out in 1819. The state capital was Knoxville till 1811, except in 1807, when it was Kingston. Knoxville, Nashville, and Murfreesboro had the honor in turns till 1826, when Nashville became the permanent capital. Three Presidents of the U. S. have come from Tennessee: Jackson (1829–37), Polk (1845–49), and Johnson (1865–69). In the Civil War Tennessee at first hesitated, but on June 8, 1861, voted to join the Confederacy. The Federal Government soon regained the capital and a large part of the state, and Lincoln appointed Andrew Johnson military governor. The contending forces fought successively the battles of Fort Henry, Fort Donelson, Pittsburg Landing (Shiloh), Stone River, Chickamauga, Lookout Mountain, Missionary Ridge, Knoxville, Franklin, and Nashville. In April, 1865, the legislature ratified the Thirteenth Amendment to the Federal Constitution, and on July 12, 1866, the Fourteenth Amendment. The usual reconstruction troubles succeeded the war. Following the war a large state debt accumulated, which has been greatly reduced.

Tennessee Riv'er, the chief affluent of the Ohio. It originates in the confluence of the Holston and the N. Fork of the Holston, near Kingsport, Sullivan Co., Tenn., flows SW. to Chattanooga, thence W., and again SW. Sweeping through N. Alabama, it turns northward, traverses Tennessee and Kentucky, and joins the Ohio at Paducah, Ky.; total length to the head of the Holston, 1,200 m.; below the confluence, 800 m. It is navigable without obstruction 280 m. to Florence, Ala., at the foot of the Muscle Shoals. Canals and locks now obviate this difficulty. Above this point the river is navigable throughout its course for the greater part of the year by light-draught steamers.

Ten'nis, a game played with small, hard balls, formerly struck by the hand, perhaps always gloved; then by the hand covered with a special gauntlet, and finally by a bat or racket; but Lawn Tennis (*q.v.*) is a distinct game. The game is played by striking the ball so as to make it bound from the upper wall or the pent house on the hazard side, and by returning it from the hazard side. The ball must strike the floor within certain limits; it must be struck on the first bound; it must not strike the net, nor the roof, nor the high wall beyond a certain line. The player counts by sending a ball into any of the openings in the lower wall, and by striking the ball on its first bound in certain ways relatively to the cross marks on the floor. The not dissimilar game of racket is sometimes encouraged by the same association with tennis; thus in New York City the Racquet and Tennis Club has a court for each game, but nowhere does the game find many players, as it is superseded by other sports, as lawn tennis, cricket, and baseball.

Ten'nyson, Alfred (Baron Tennyson), 1809–92; English poet; b. Somersby, England. He was a pupil of Louth Grammar School, 1816–20. During the next eight years he was educated at home by his father and private teachers. The rector requiring only a moderate amount of intellectual work, he was out of doors much of the time, rambling in the woods and pastures about Somersby. He was solitary and reserved, moody and absent-minded, the mental habits of the boy foreshadowing the characteristics of the man. His literary career began in his youth, his boyish rhymes and those of his elder brother Charles being collected into a volume, "Poems by Two Brothers" (1827). He composed a labored narrative entitled "The Lover's Tale," two parts of which were printed, 1833, but suppressed; in 1879 the entire poem was given to the world in a more finished dress. In October, 1828, Tennyson entered Trinity College, Cambridge, leaving in 1831 without a degree. Here he was fortunate in having the companionship of choice spirits, but he owed most to one whose name is forever associated with his own—Arthur Henry Hallam, a son of the historian. This dearest of his friends, whom he calls more than brother, became the betrothed of his sister Emily. Together they traveled in the French Pyrenees in 1830. Hallam's sudden death (September 15, 1833) in Vienna made an ineffaceable impression on Tennyson, and may be considered an important agency in shaping his character and poetical career. In producing "In Memoriam," he conferred immortality upon his lost friend and won it for himself.

In 1829 Tennyson won the chancellor's gold medal for the prize poem, "Timbuctoo." In 1830 appeared his first book, "Poems, Chiefly Lyrical." His second book of "Poems" (1832) was more ambitious. It contained some of his loveliest lyrics, having the richness of melody and the witchery of style which constitute

Tennyson's charm, yet it found but few admirers. Not many reviewers noticed it. Stung by the savage criticisms of Wilson and Lockhart, he set himself to the task of improving what he had written. He experimented with various styles and meters; thus he served his laborious apprenticeship as poetic artist. Ten years passed, then he issued his "Poems" (1842) in two volumes. The singer, hitherto unrecognized, was greeted with universal praise. The new spirit of the age found an exponent in his verse, which reflected the unrest and hopefulness of a transitional era. This was the beginning of a series of triumphs and honors. In 1845 he was granted a pension of £200; in 1850 he was appointed poet laureate to succeed Wordsworth, and in 1855 he received the honorary degree of D.C.L. from Oxford. He roamed on foot through England and Wales, often visiting friends in London and elsewhere, and making occasional trips to Ireland and the Continent. His writings prove that he was a close observer of nature as well as a diligent student of books. Hamerton called him the "prince of poet landscapists." "The Princess," in which he first essayed extended narrative in blank verse, was published in 1847.

In 1850, which is called his golden year, appeared anonymously the poem that is generally regarded as Tennyson's masterpiece, "In Memoriam," a monumental work in process of growth during the seventeen years after Hallam's death. In 1855 "Maud and Other Poems" was published. The volume contained two patriotic lyrics, "Ode on the Death of the Duke of Wellington" (1852), and "The Charge of the Light Brigade" (1854). "Maud" was at first misjudged and underrated, but later won its way. The appearance of "Idylls of the King" in 1859 was a literary sensation. Tennyson's fame was now international, and his books sold by the hundreds of thousands. His next publication, "Enoch Arden," has been the most widely read of the laureate's writings in foreign lands, having been frequently translated. Four more Arthurian romaunts were added in "The Holy Grail, and Other Poems" (1869), two in 1872, and one in 1885. This series of tales, if not entitled to the name of epic, is the greatest of his literary undertakings; the longest of his works, though not the most original. At threescore he showed no signs of failing powers. The last two decades of his life were exceptionally productive of works stamped with dignity of thought, felicitous expression, and musical versification. The list includes the dramas, "Queen Mary," "Harold," "Becket," "The Cup," "The Falcon," and "The Foresters," several of which were put on the stage.

Tennyson is not a world poet, his appeal being more or less insular. He has been criticized for being a "chanter of the aristocratic idea," yet he was a poet of the common people as well as of lords and ladies. He was master of the technical resources of the poetic art, and possessed unrivaled power as a word painter. But the domain of beauty was too narrow for him. Beyond any mere æsthetic influence that he exerted, he was a mighty force for good, his polished verse being the vehicle of ethical instruction and spiritual uplift. His success is largely explained by the fact that he clothed in artistic form the higher thought and sentiment of his time. Tennyson's career was unstained by excesses; his life was a poem. He was a man of many-sided culture, keenly interested in astronomy, geology, botany, and other sciences. He was familiar with the discussions and speculations of physicists and metaphysicians.

Ten'or, the highest kind of adult male voice. The average compass of a true tenor is from C in the bass staff to A in the treble, and rarely two or three tones higher.

Tenor Violin'. See VIOLA.

Tent, a pavilion or portable lodge made of skins, strong cloth, or canvas, sustained by one or more poles, and used as a shelter from the weather, especially by soldiers in camp. The material used as a covering is usually stretched by means of cords secured to tent pegs. Such portable shelters have been used as homes by nomadic tribes from the earliest ages. The patriarchs were dwellers in tents, and the poorer classes in Persia, China, and other Eastern countries still live in tents formed of frames of wood covered with a thick cloth, felt, or matting. Different forms of tents for military purposes have been employed in the armies of the U. S. and of Europe. Prior to the Civil War the Sibley tent, which is a conical tent, supported by a central pole resting on an iron tripod, and capable of sheltering fifteen infantry soldiers or thirteen mounted men, was used in the U. S. army. One of its advantages was that it could be warmed by an open fire or small stove, and afforded ample ventilation, having a circular opening at the apex partially covered by a movable piece of canvas, so arranged as to be shifted according to the direction of the wind. It resembled a Sioux lodge, the chief difference being that it was constructed of canvas and supported by the central pole and tripod, while the Indian lodge was made of rudely tanned buffalo skins stretched on several long wooden poles.

The tents used in the U. S. military service include the hospital tent, which is made to open at both ends, so that several may be placed together and form a continuous ward. Each tent holds from six to eight beds. The wall tent is used for officers and the conical wall tent for enlisted men. The shelter tent, which is a modification of the French *tente d'abri*, consists of two pieces of cotton duck. In active service each soldier carries half a tent, which may serve as a cloak on the march, as a covering at night, and when the two pieces are joined forms a tent for both men. Besides military tents, there are special forms of tents made for emigrants, lumbermen, gypsies, surveyors; prospecting parties, as in railway construction, have tents devised for their wants. There are pleasure tents of many forms, as those used for camping out, for lawns (square and oblong), for children, for screens, as the surf tents used on beaches. Besides large circus tents, which are of heavy twilled duck and special construction, there are boarding tents, stable tents, and house tents; also special tents for agricultural and other fairs, with varieties for the sale of refreshments and exhibition of side shows; also photographers' tents, illusion tents, etc.

Ten'rec. See TANREC.

Ten Thou'sand, Retreat' of the, the homeward march of about 10,000 Greek mercenaries from Cunaxa, a town 60 m. N. of Babylon. At Cunaxa their leader, Cyrus the Younger, was killed in battle against his brother, Artaxerxes II (401 B.C.). Thereupon their Persian allies dispersed and the Greeks were left in a critical position. Their only possible line of escape was by the upper Tigris through the country of the Kardouchi (the modern Kurds), and across the highlands of Armenia to some Greek city on the Black Sea. At the river Zapatas their five principal generals were assassinated by the Persian satrap Tissaphernes. Thereupon Xenophon, then a private soldier, was elected a general, and became practically commander in chief. After a winter's march of over 700 m. in an enemy's country, they reached Trapesus (Trebizond). Finally they arrived at Chrysopolis, opposite Byzantium (400 B.C.). Their successful escape revealed the weakness of the Persian Empire and encouraged Alexander to undertake its subjugation. In the "Anabasis" Xenophon describes this retreat.

Ten'ure, the manner in which real property is held or owned. The exigencies of the feudal system, which required the complete dependence of the man upon his lord and of the lord upon the king, substituted for the notion of absolute ownership of lands—such as was recognized in the case of goods and chattels—the conception of "states" in land, the land being deemed to be held of and in subordination to the lord of the man and of the land. These estates were qualified interests, resting upon a recognition of a superior right vested in the person of whom the land was "held," and dependent for their continuance upon the due performance of the terms and conditions of such "holding." It is true that the early English law recognized an "allodial" or absolute ownership of lands, but this did not long survive the Norman Conquest. It became a maxim of English law that the king is the ultimate and absolute owner of all the lands in the kingdom, and that all of his land-owning subjects are only his tenants. He who held directly or immediately of the king was said to hold in chief (*in capite*); but the tenant *in capite* is not usually the person who deals with the land as owner.

So important is this fact of service that the principal classification of tenures is by the service to be performed. A tenant may hold his lands in fee simple, fee tail, or for life, but his tenure is by "knight service," or by the service of "free alms," or by the service of "serjeanty," or by the service of "socage." (1) Knight's service was created by "homage," a solemn act by which the tenant acknowledged his lord as him of whom he held his land and to whom he was bound to render service, and from which, on the other hand, arose the duty on the part of the lord of protecting his tenant. This tenure was, as its various designations indicate, based upon the performance by the tenant of military service in the army of the king. (2) Serjeanty required the tenant to perform some personal and ofttimes domestic or menial service to his lord, as the "grand serjeanties" of the king's marshal, chancellor, or justiciar, or the "petty serjeanty" of the freeman who supplied his lord with arrows or knives for the chase. (3) Tenure by frankalmoign implied spiritual service—to sing masses, to distribute money among the poor, etc.—and the land was, as between the donor and the tenant in frankalmoign, held free from any services or dues of a secular nature. (4) Socage tenure comprehended all freehold lands not held by military, or "domestic," or spiritual tenure. By statute of Charles II all freehold tenures were turned into free and common socage, and this has continued to be the well-nigh universal form of land holding in England. The so-called "burgage" tenure was merely a form of socage which obtained in certain boroughs. The tenures of borough English and gavelkind were only local variations of socage tenure.

There were also lands held at the will of the lord, perhaps for the life of the tenant, sometimes even by the tenant and his heirs forever—upon the service and condition of agricultural or other labor to be performed at the lord's will. This service was called "villanage." Later the condition of labor was commuted into rent, and the copy of the "roll" or record of the lord's court, in which was recorded his accession to the estate, became his muniment of title. He was now a "copyhold" tenant and was said to hold "by copy of court roll." Copyhold tenure still prevails in England.

The usual incidents of tenure were: (a) Relief: a fine paid to the lord of the fee by the heir upon the death of a tenant of an estate of inheritance. (b) Aids: regular or irregular exactions made by the lord to enable him to meet his own pressing necessities. They were regularly and lawfully claimed for the purpose of ransoming the lord from the enemy, for knighting his eldest son, and for marrying off his eldest daughter. (c) Wardship and Marriage: the right of the lord of a minor tenant to the custody or wardship both of the land and tenant during the minority of the latter, as well as to dispose of the infant tenant in marriage. These rights were during the latter part of the feudal *régime* the principal source of revenue to the king and the other territorial lords. The lord was entitled to all the rents and profits of the tenement for his own use during the continuance of the wardship, and he might "sell" the young heir, whether boy or girl, in marriage. (d) Escheat: the lord's right to resume an estate in fee upon failure of the estate. Nothing is more significant of the reality and permanence of the lord's rights in the lands held of him than this notion of the escheating or reverting of the estate to him.

The more burdensome of feudal tenures—*i.e.*, the military tenures—never gained a foothold on the American side of the Atlantic. The earliest colonial charters invariably provided for socage tenure. The usual provision was that the land should be holden of the king "in free and common socage, by fealty only, for all services, and not in capite or by knight's service." Tenure in this form, the lordship of the state being substituted for that of the king, and all feudal incidents being abolished, survives in New Jersey, Pennsylvania, S. Carolina, Georgia, and several other states. In New York and most of the remaining states "all feudal tenures, with all their incidents," have been abolished even in name, and all lands are declared by statute "to be allodial, so that, subject only to the liability to escheat, the entire and absolute property is vested in the owners."

Tenure of Of'fice Act, an act passed by Congress in March, 1867, as a result of the controversy between Pres. Johnson and Congress. It provided that a person appointed to office by the President and approved by the Senate should hold office till another person was appointed to the position with approval of the Senate, and that members of the Cabinet should hold office for the term of the President appointing them and one month thereafter, "subject to removal by and with the advice and consent of the Senate." An officer might, however, be suspended while the Senate was not in session and the place given for the time being to some other person.

Tepic (tā-pĕk'), territory of Mexico separated, 1889, from the NW. part of Jalisco. Most of the inhabitants are Indians, who maintain a quasi-independence. Pop. (1900) 150,098. Tepic, the capital, is on a plateau 18 m. from the bay of San Blas, has a fine view of the Pacific, and manufactures cotton cloth, cigars, etc. Pop. (1900) 15,488.

Ter'aphim, images or figures, probably used by the ancient Hebrews either as objects of household worship or as religious symbols. Nothing satisfactory is known of their character, origin, or use. They were found in Jacob's and David's houses as household gods (Gen. xxxi, 30, 32–35; I Sam. xix, 13–16); Josiah attempted their suppression (II Kings xxiii, 24); also see Hosea iii, 4.

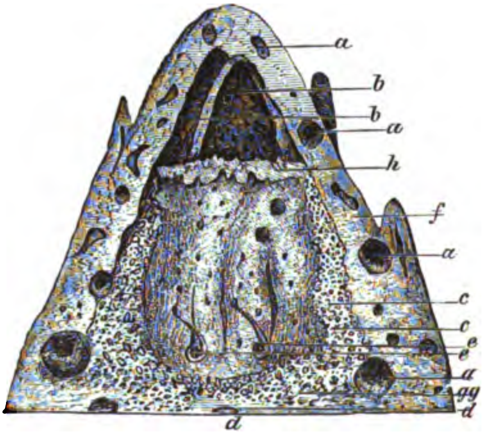
Ter'bium, a substance associated with erbium and yttrium in the mineral gadolinite, and supposed to be a new element; but its existence is doubted.

Ter'burg, Gerard, 1608–81; Dutch painter; excelled in color and the finish of his draperies, especially white satin.

Teredin'ids and **Tere'dos,** family of mollusks, very destructive of timber used as piles in the ocean. The "ship worms" are its chief representatives. They feed on infusoria, etc., but form a long burrow in which to conceal themselves, and the largest piles may be destroyed by them in two or three years. The only remedies are to prevent the teredos from entering the wood by sheathing, painting with coal tar, etc. Their distribution is wide; have been particularly noted on the Pacific coast, where wharves have been totally destroyed by them.

Ter'ence, Publius Terentius Afer, abt. 195–159 B.C.; Roman comic poet; b. Carthage. He became a slave of P. Terentius Lucanus, a Roman senator, who gave him an excellent education, and finally freed him. The "Andria," his first play, was acted in 166. Later in life he went to Greece, and there translated 108 of Menander's comedies. Six of his comedies are extant—the "Andria" ("The Woman of Andros"), "Hecyra" ("The Stepmother"), "Heauton-Timoroumenos" ("The Self-Tormentor"), "Eunuchus" ("The Eunuch"), "Phormio," and "Adelphi" ("The Brothers"). The Romans generally did not appreciate the works of Terence; but their purity of language, elegance of diction, and refinement of humor made them favorites with the more cultivated Romans, as well as later scholars.

Termites (tẽr'mīts), insects; also called WHITE ANTS from the fact that, like the ants, they are social. The termites form large colonies, and in each colony the individuals are differentiated into different castes, each being fitted by structure for its duties. Only the king and queen are winged. The mouth parts are efficient biting organs. The wingless forms are grouped into small-headed workers and soldiers with enormous heads. The king and queen are the sexual members of the colony; they swarm from the nest, take a marriage flight, and then lose the wings, and under favorable circumstances found a new colony. Before egg laying the abdomen of the female becomes enormously distended with eggs. The workers wait upon the royal pair, feed the young, do all the excavating, and store away the food, etc. The soldiers are far less numerous, and are the fighters of the colony, and in some species act as overseers of the workers.

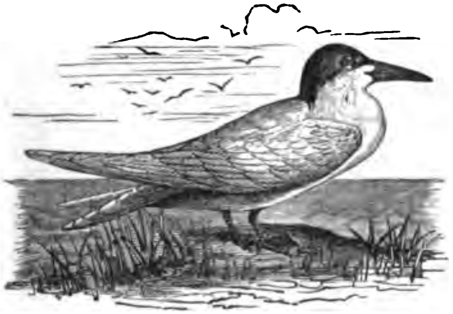


VERTICAL SECTION OF TERMITE'S NEST, FROM APEX TO GROUND. *a, a, a,* galleries penetrating outer dome; *b, b,* air chamber; *c, c,* magazine and nurseries; *d, d,* royal chamber; *e, e,* bridges; *t,* outer shell; *g, g,* congeries of royal ante-chambers.

The great home of the termites is in the tropics, but they also extend into colder climates, one species being found in New England. These N. forms do little damage, although one year they seriously threatened libraries in Cambridge. In the tropics they are a formidable pest.

The termites are dark-loving forms, and the workers and soldiers are blind. They are rarely seen, since they are miners and spend their whole lives in the tunnels which they excavate. When they wish to attack a piece of timber they build a covered approach of earth and saliva, and then when the wood is reached their tunnels run through it in every direction, until at last only the thinnest shell remains, ready to crumble at the slightest touch. In this way they build their mortar approaches up the trunks of the largest trees in order to reach dead branches. They do good in tropical forests by removing dead timber, but when they attack human habitations the results are serious, since the ravages give no external sign. They will completely riddle every bit of timber in a house, and have even been known to enter a table through its legs and leave nothing but the outside, ready to collapse upon the slightest strain. The species found in the U. S. lives in decaying wood, but some of the tropical species build conical nests surmounted by pinnacles, and in some cases these nests are 10 to 15 ft. in height and 40 to 50 in circumference. They are made of clay, packed, and cemented by saliva, while in the interior are passages and storerooms for food, nurseries for the young, quarters for the workers and soldiers, and always near the center of the base is the royal chamber where the queen is kept.

Tern, any small gull of the *Sterninæ*, or sea swallows. They are characterized by their slender build, remarkably long, pointed wings; rather long, sharp beak; small feet, and, usually, deeply forked tail. They range in size from 2 ft. in length down to 9 in. The general style of plumage is white, with a pearly mantle, and top of head black; but there are exceptions to this, the sooty tern and noddy being almost black. Terns are found over the greater part of the world. They nest on the ground, and feed on fishes and small crustaceans. See EGG BIRD.



TERN.

Terpan'der, Greek musician of the seventh century B.C. He established in Sparta the first musical school in Greece, enlarged the compass of the lyre from four to seven strings, and was the first who regularly set poetry to music.

Terpsichore (tẽrp-sĭk'ō-rē), one of the nine Muses; she presided over song and choral dancing, and is represented with lyre and plectrum in her hands and a wreath of flowers on her head.

Ter'race, a limited plain, natural or artificial, from which the surface descends on one side and ascends on the other. They have extensive use in agriculture, especially in S. Europe. Gentle slopes are sometimes worn into gullies and steep ridges when cultivation exposes them to the action of rain. To prevent this, the land is graded in terraces whose flat surfaces give the rain-water rills no power to erode, and the steep bluffs between the terraces are guarded by turf or stone. Natural terraces are of various kinds, the most abundant being terraces of differential degradation. Frost and other agencies that break up rocks act more rapidly on weak rocks, such as shales, than on strong rocks, and reduce them to earth which is washed away by rain. Often a weak rock is in this way eaten back until the strong rock above it is deprived of support and falls away in blocks. By such processes the hillside is carved into a series of terraces separated by bluffs or cliffs. Stream terraces are next in abundance. When the volume and grade of a stream are so adjusted to the load of detritus it carries forward that it neither wears down nor builds up its bottom, the stream wears its banks, making a flood plain, and this gradually becomes broader. If the stream is overloaded, part of the load is deposited, and the flood plain grows higher as well as broader. If then the land is lifted, or the flow of water is increased, or the load is diminished, the stream cuts its channel deeper and ceases to spread over the flood plain, which then constitutes a terrace on each side of the stream. A repetition of this process produces a series of terraces rising like steps on the valley side, and such series are to be seen in many valleys of the U. S. *Shore terraces* are frequently carved out by the waves where the sea attacks the land. They are overlooked by cliffs, and are usually submerged at high tide. On parts of a coast where drifting sand or shingle accumulates, beach being added to beach, a rather uneven terrace is produced, and this is bounded seaward by a submerged declivity. *A moraine terrace* is formed where a stream of water flows between a glacier and the side of its valley. The earth and stones of the lateral moraine, together with other material brought by the stream, are built by the running water into a plain; and afterwards, when the glacier has disappeared, this plain constitutes a terrace on the valley side.

Ter'ra Cot'ta, baked clay, that is to say, pottery. In the language of decorative art the term is used for an object made of baked clay, such as the Tanagra figurines. Early Roman architecture used many terra-cotta ornaments, and in modern times the taste for terra-cotta cornices and other ornaments is growing, especially when they consist of many repetitions of the same pattern, as they can be made cheaply in pleasing colors.

Terra de Fue'go. See TIERRA DEL FUEGO.

Ter'rapin, any one of various small freshwater turtles of the *Emydidæ*. The name has no exact scientific meaning, but in the U. S. is usually applied to the salt-water terrapin (*Malaclemmys palustris*), or diamond back. This species, esteemed for the delicacy of its flesh, is an inhabitant of the salt-water marshes from New York to Texas. It has a large head, covered with a soft, naked skin; the skin is gray, spotted, and otherwise marked with black. It rarely much exceeds 8 in. in length. It commands from $15 to $100 a dozen, according to size, season, and demand. It is active in the water, swimming well, and on land runs with considerable speed.

TERRAPIN.

Terre Haute (tĕr'ê hōt), city (founded in 1816); capital of Vigo Co., Ind.; on the Wabash River, 73 m. W. of Indianapolis. It is on a rolling prairie between the Wabash and a low range of wooded bluffs, and contains three parks, Union Station, Collett, with thirty acres, and a driving park and fair grounds of ninety acres, with a noted racing track. The city is surrounded by coal fields, and has five productive oil wells, and two artesian wells, supplying sulphur water. The notable buildings include the county courthouse, U. S. Govt. building, Union Station, state normal school, opera house, and St. Benedict's Church—the finest in the state. The Rose Polytechnic Institute is an advanced school of engineering and chemistry, founded by the late Chauncey Rose. The charitable institutions include the Rose Ladies' Aid Society, St. Anthony's Hospital, Union Hospital, Rose Dispensary, Rose Orphan Home, and St. Ann's Orphan Asylum. The industries include glass factories, railroad works, rolling mills, breweries, four box factories, flour and hominy mills, foundries and structural-iron shops, carriage works, boiler shops, cooperage, clothing factories, and the distilleries, which include the largest in the world. Pop. (1907) est. at 52,805.

Terres'trial Mag'netism. See MAGNETISM, TERRESTRIAL.

Ter'rier, any one of a large number of breeds of small dogs distinguished for vivacity and courage. Among the best known are the English or black-and-tan terrier; the bull terrier, a miniature bulldog in courage, and often in shape; the fox terrier, formerly used to unearth foxes; the Scotch or rough-haired terriers, including the Skye, the Dandie Dinmont, and other strains; and the toy terriers, crosses with some of the small lapdogs. Most of the various breeds of terrier are especially trained to the killing of rats and other vermin.

SKYE TERRIER.

Ter'ritory, a term technically applied in the U. S. and in some Spanish-American republics to certain portions of the public lands which are under the direct control of the national legislature. In the U. S., territories are organized by congressional enactment. The governor and the administrative and judicial officers are appointed by the President, but a territorial legislature is intrusted with limited powers, subject to the approval of Congress. When a territory attains a population sufficient to entitle it to one representative in Congress, it has usually been given permission by a special act to form a state constitution, and then admitted into the Union with rights equal to those of the other states. See CONSTITUTION OF THE U. S., Art. iv, Sec. 3. With the exception of Texas, California, W. Virginia, and the original thirteen colonies, all the states of the Union have passed through the territorial stage.

Ter'ror, Reign of. See FRENCH REVOLUTION.

Ter'tiary E'ra, a division of geologic time coördinate with the Primary era, and Secondary era, which it follows, and the Quaternary era, which it precedes. In the later and widely adopted classification based on life, the Cenozoic era is made to include the Tertiary and Quaternary. Tertiary time is divided by European geologists into four periods—Eocene, Oligocene, Miocene, and Pliocene. The U. S. Geological Survey represents these by two periods named Eocene and Neocene.

Tertul'lian (QUINTUS SEPTIMIUS FLORENS TERTULLIANUS), abt. 150–240 A.D.; the most ancient of the Church Fathers; b. Carthage. He was a lawyer and afterwards a priest, and became widely known by his controversial treatises, as well as his ascetic practices. About 202 he joined the Montanists, and became the champion of the sect. He was the fearless champion of Christianity against Jews and pagans and of catholic orthodoxy in the Church. His "Apologeticus" is one of the best defenses of Christianity. He led the way in ecclesiastical anthropology and soteriology, and was the teacher of Cyprian and the forerunner of Augustine. Among his practical works is one against second marriages. His specially Montanist writings include "On Chastity," which denies that those who are guilty of gross sins can be absolved, and "On Flight," which insists that Christians ought not to flee from persecutions. He was stern and uncompromising—a Puritan of the early Church. Tertullian's works are written in a rude Punic Latin. The style is nervous, abrupt, often obscure, and vehement. Many of his pointed sentences, as "the blood of the Martyrs is the seed of the Church," have become proverbs. His life was written by Jerome.

Tes'la, Nikola, 1857- ; American electrician; b. Smiljan, Croatia; graduated Polytechnic School, Gratz; came to the U. S. and was associated with Edison; became electrician of the Tesla Electric Light Company, and established the Tesla laboratory in New York for independent electrical research. He is the inventor of the modern principle of the rotating magnetic field embodied in the apparatus used in the transmission of power from Niagara Falls, of new forms of dynamos, transformers, motors, induction coils, condensers, arc and incandescent lamps, and of the oscillator, combining steam engine and dynamo, etc. His researches in electrical oscillation have opened a new field for scientific investigation.

Tessin'. See TICINO.

Tes'taments, Old and New. See BIBLE.

Tes'timony. See EVIDENCE.

Test Oath, the oath required by the Corporation and the Test Acts (13 Car. II, st. 2, c. 1, A.D. 1661, and 25 Car. II, c. 2, A.D. 1672) to be taken by civil and military officers. Blackstone describes these statutes as "two bulwarks erected in order the better to secure the Established Church against perils from nonconformists of all denominations, infidels, Turks, Jews, heretics, Papists, and sectaries." They made the holding of public office conditional upon the incumbent's taking the oaths of allegiance and supremacy, and subscribing a declaration against transubstantiation and receiving the sacrament of the Lord's Supper according to the Church of England. After various modifications, they were substantially repealed in 1828. During the Civil War in the U. S. and after its close test oaths were imposed by Federal and state legislation, but were soon declared unconstitutional.

Testudina'ta. See TURTLES.

TESTUDO.

Testu'do, among the ancient Romans a cover or screen which a body of troops formed with their oblong shields or targets by holding them over their heads when standing close to each other. This cover somewhat resembled the back of a tortoise, and served to shelter the men from the missiles thrown from above. The name was also given to a structure movable on wheels or rollers for protecting sappers.

Tet'anus, or **Lock'jaw,** a dangerous disease caused by the tetanus bacillus, and characterized by spasmodic muscular contractions. The spasms usually appear first in the muscles of mastication. Death usually occurs by arrest of respiration. Tetanus is more frequent in warm climates. The bacillus, which is present in most garden soil and about stables, enters the system through cuts or wounds which are infected with dirt. Opium, chloroform, etc., are useful in treating tetanus, but the best remedy is in the injection of antitoxins.

Tetrahe'dron, a solid having four bounding planes, four solid angles, and six edges. If regular, its sides are equilateral triangles.

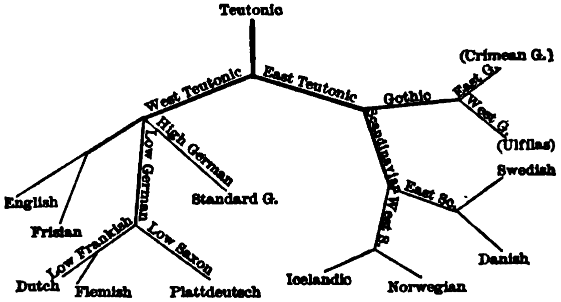
Tetrarch, a name which strictly designated, originally, the viceroy or monarch of the fourth part of a country (Thessaly, etc.), but later a titled bestowed, especially under the Romans, upon the minor tributary princes of the East.

Tetuan', town of Morocco; near the mouth of the Martil; in a fertile region, celebrated for its oranges. The town is fortified, and has several fine mosques and an active trade in woolen and silk stuffs, leather, and fruit. Pop. 20,000 to 25,000, one quarter Jews.

Tetzel, or **Tezel** (tĕt'sĕl), **Johann,** 1465–1519; a Dominican preacher of indulgences. His preaching to encourage contributions for the building of St. Peter's at Rome led Luther (*q.v.*) to publish his famous ninety-five theses.

Teuton'ic Knights, a military ecclesiastical order, founded in 1190 by some N. German merchants, who had been moved by the sufferings of the Crusaders at the siege of Acre. It soon found a patron in Frederick, Duke of Suabia, and secured charters from the emperor and the pope entitling it to all the privileges possessed by the two great rival orders of the Knights Templars and the Knights of St. John. The members of the order were required to be Germans of noble birth, but priests and half brothers, not noble, were admitted. In the early times they took vows of chastity and poverty. In 1230 they entered upon a crusade against the Prussians, and, after a century of hard fighting, established their rule over Prussia, when they fixed their headquarters at Marienburg. They served in the crusades of St. Louis, 1248–50; founded Königsberg in 1255, and attacked the heathen Lithuanians in 1283. They were for many years involved in wars with Poland; held at times E. and W. Prussia, Esthonia, Pomerania, and other neighboring countries. In 1466 they surrendered W. Prussia to Poland, and recognized the latter's feudal ownership for E. Prussia, when Königsberg became their capital. In 1525 their grand master, Albert of Brandenburg, converted Prussia into a secular hereditary dukedom, and in 1527 the seat of the order was transferred to Mergentheim, in Suabia. In 1561 they lost all their Livonian possessions. In 1805 the Emperor of Austria became grand master of the order. In 1809 Napoleon declared the order abolished, and gave its lands to various German sovereigns. In 1840 the Austrian Emperor reorganized the Teutonic Knights, and in 1865 the order was still further reorganized.

Teuton'ic Languages, a branch of the Indo-European family of languages. The term Germanic is also used, especially in Germany, where it is supplanting the older term Deutsch. The members of this group may be enumerated and compared with the aid of the following diagram. Teutonic is general and theoretical, and represents the one prehistoric language spoken by the Teutonic stock in central Europe, between the Baltic and the Black Sea. The first divergence in general Teutonic was between E. and W. Teutonic. E. Teutonic is divided into Gothic and the Scandinavian languages, but the differences between the two are more striking than their similarities. The W. Teutonic division stands out as more distinct and compact. Applying Grimm's law in its second shifting we get three subdivisions: (1) High German, which shifted most of all; (2) Low German, which shifted *th* to *d*; (3) English, which, like Gothic and Scandinavian, shifted only once. The Frisian language stands between English and Low German. Some of its modern dialects have preserved *th*, some shifted it to *d*, and even to *t*. The general term Low German should be limited to the non-High German continental dialects, including modern Dutch, Flemish, Plattdeutsch, and perhaps Frisian, all of which shifted *th* to *d*.



Teu'tons, the members of the Teutonic branch of the Aryan family. Much uncertainty is manifested in the extent of the application. The Greek and Latin authors seem to have used the word to designate only a certain portion of the great race then inhabiting the lands N. of the Alps and E. of the Rhine which undertook, in company with the Cimbri, to invade the Roman Empire abt. 113 B.C., and whose original abode had been probably the W. coast of Schleswig-Holstein and the territory about the mouth of the Elbe.

In its broadest sense must be included under the name Teuton, in the first degree, the Germans of the Continent—*viz.*, the inhabitants of the German Empire, of Austria proper, of the N. and NE. cantons of Switzerland, of Holland, and the Scandinavians of the two N. peninsulas; in the second degree, the English, the inhabitants of Lower Scotland, and the inhabitants of the U. S.; while in the ethnological composition of almost every truly European nation—that is, every nation W. of Russia proper and Turkey—the Teutonic component enters in a greater or less degree.

At the close of the fifth century, when the great movement known in European history as the migration of the peoples ended, the Teutons were the ruling race from Carthage to the Vistula; the Vandals in Africa from Carthage to Gibraltar; the Visigoths from Gibraltar to the banks of the Loire; the Suevi occupying Portugal; Burgundians from the upper Loire to the center of Switzerland; the Ostrogoths from the last-mentioned boundary to that of the present Turkish Empire on the E., and from the Mediterranean on the S. to the Danube on the N.; the Franks from the lower Loire to Thuringia; Saxon conquerors upon the English coasts; Saxons Frisii, Thuringians, Marcomanni, Bavarians, and Longobardi still upon the original German soil, the latter moving down a little later (last half of the sixth century) into Italy, and occupying the plain of the upper Po, while the Scandinavic branch reached round the entire E. and SE. shores of the Baltic and far inland. In Africa, Hispania, SW. Gaul, and middle and S. Italy the Teutonic element disappeared almost entirely in the amalgamation with the Romantic population; while, on the other hand, the inhabitants of N. and NE. France, of Belgium, of N. Italy, and of Russia's Baltic provinces manifest still most strongly the ethnological characteristics of the Teutons.

Individual liberty and personal worth were the fundamental principles of the old Teutonic life and polity. In the old assemblies of the village, the hundred, and the tribe it was the will of the freeman which was the authority of law. While in Rome the central power was the strongest, and there existed no local power worth the name, save as an imperial agency, among the Teutons, again, the local power was always the strongest, and centralization always opposed, defied, and overthrown. When Marbodius, the Marcomannic duke, and even Arminius, to whom the German tribes were indebted for the expulsion of the Roman legions, attempted to retain in peace the centralized authority which they had exercised as leaders in war, the one was obliged to flee to Rome, while the other fell a victim to his fatal ambition. To this Teutonic spirit of liberty we owe, even in the midst of the Middle Ages in Germany, the establishment of municipal privileges and citizens' rights in the Hansa towns, the personal freedom of the members of the guilds, which constitutes the basis of modern individual rights; in England, Magna Charta and before the end of the thirteenth century the first representative Parliament, with the establishment of the English common law, which is the nucleus of the legal procedure and the guaranty of the civil rights, of the English-speaking people at least, all over the world. This spirit of individuality, typically Teutonic, has given to modern civilization its freedom of thought and conscience, its estimation of men above institutions, its doctrine of popular sovereignty, its local self-government, and its national development.

Tex'as, one of the U. S. of N. America; the fifteenth in order of admission into the Union; popularly known as the LONE STAR STATE, the largest state in the Union. Capital, Austin. It is bounded NE. and E. by Oklahoma, Arkansas, and Louisiana, SE. by the Gulf of Mexico, SW. by Mexico, and NW. by New Mexico, with a projection, known as the Panhandle, included between Oklahoma on the N. and E. and New Mexico on the W.; area, 265,780 sq. m. Pop. (1910) 4,745,030.

In its geology and topography Texas is composed of areas marked by typical aspects. The NE. part belongs to the forest belt extending across the S. States, the NW. to an extensive plain reaching downward through several states from the N., and the SW., beyond the Pecos River, to the Rocky Mountain system. The surface of the state, omitting the Transpecos region, consists of a series of benches, parallel to the Gulf coast, rising gently toward the NW., and culminating in the plateau of the Llano Estacada, or "Staked Plains," so called from the abundance of yucca stems, resembling stakes. The Transpecos country is covered with scattered mountain peaks and ranges having great basins between. The principal benches named in order from the SE. are the Coast Prairie, the Lignitic Belt, the Black Waxy Prairie, the Grand Prairie, and the Central Denuded Region. Beyond the last lies the Llano Estacada. The Coast Prairie has a width varying from 50 to 100 m., and the SE. edge, with its long, easy slope, extends far out under the waters of the Gulf. The Lignitic Belt has an undulating surface, and is made up of plains, from some of which great basins have been carved out by rivers.

The surface of the Black Waxy Prairie rolls gently, and is marked by numerous small hollows or depressions known as hog wallows. This prairie is about 140 m. wide along Red River, about 85 m. on the Rio Grande, and only about 10 where the Colorado intersects it. The Grand Prairie is a great plateau, the SW. part of which is a bed of hard limestone. Its SE. edge is marked by a cliff reaching from the Colorado to the Rio Grande, known as the Balcones. Many springs, remarkable for beauty, burst out along the base of this escarpment. The Central Denuded Region is a basin having a maximum width of 180 m. It extends S. into the state for more than three fourths of the distance across and separates the Grand Prairie from the Llano Estacado. The Grand Prairie, however, sweeps around the S. end of the basin and reaches the Llano Estacado in that quarter. The latter is a vast table-land, sloping gently to the SE. The coast has a line of long, narrow islands extending along its front at a distance of 10 to 20 m. From Galveston NE. these islands sink into shoals. The principal bays are those of Galveston, Matagorda, Espiritu Santo, Aransas, Corpus Christi, and Alazan. While there are districts in N. and central Texas mountainous in geological formation, the only elevations deserving the name of mountains by their altitude are in the Transpecos country. The rivers all have SE. direction, except the Canadian and the Red. The former flows NE. across the Panhandle, and the latter nearly E. along the N. boundary. The principal remaining rivers named in order toward the SW. are the Sabine, Neches, Trinity, Brazos, Colorado, Guadalupe, Nueces, and Rio Grande, with its tributary the Pecos. The Canadian, the Red, the Pecos, and the Rio Grande originate beyond the state, and their sources are included in a comparatively small district of upper New Mexico and lower Colorado.

The coast prairie has a fertile soil of sandy loam, with a red or yellow clay subsoil. The alluvial deposits of its river bottoms are exceedingly rich. In the Lignitic Belt the pine uplands have a gray sandy soil, usually not very fertile, but the lowlands are better. The Black Waxy Prairie, though somewhat difficult of tillage, is one of the finest agricultural areas of the world. The NE. half of the Grand Prairie is covered with a chocolate soil of great productive capacity. The SW. half has a rougher surface, and the soil is shallow, the parts fit for cultivation being mainly the valleys. The Llano Estacado is deeply covered with a brown loam, suited especially for wheat and fruit. The mineral resources of Texas are great, but as yet little developed. Salt is obtained from lakes along the Rio Grande border and from salines in E. Texas. Extensive beds of rock salt exist in Van Zandt and Mitchell cos. In E. Texas lignite has been found throughout a large district. In the central and W. parts are beds of bituminous coal. The workable area of the central beds is estimated at 2,300 sq. m. Near the Sabine River oil wells produce over 25,000,000 bbls. per annum.

There are deposits of iron ore in E. Texas, in the Transpecos region, and adjacent to the town of Llano. Copper ore exists in the last two localities, and also in NW. Texas. Lead occurs in the Central Mineral Region and the Transpecos district, and in the latter zinc as well. Gold and silver are found in both these sections. There are numerous quarries of good building limestone in the state, and several of sandstone. Among the most durable and costly varieties of stone are the granites, marbles, and serpentines of Burnet and Llano cos. and the Transpecos region. The principal forests are in E. Texas, and the prevailing growth is pine. In the W. part of the forest region oak, hickory, and ash are common. In the river bottoms of the SE. cypress is abundant, and in the NE. bois d'arc. Running from Red River S. are two belts of post oak and black-jacks about 40 m. apart, the E. being known as the Lower Cross Timbers and the W. as the Upper Cross Timbers. Toward the SW. the forests disappear and are replaced by cedar brakes, stretches of mesquite, etc. Along the Rio Grande border are dense thickets of chaparral, mimosa, and acacias. Texas ranks first among the cotton-growing states. It produces also large crops of maize, wheat, and oats.

The animals of Texas, like the vegetables, change in type in passing from the N. and E. toward Mexico. In the forests and along the streams of the E. part are the red deer, beaver, squirrel, gopher, and badger, with an occasional brown bear and panther. On the plains and in the more rugged districts of the W. are antelopes, black-tailed deer, and big-horn sheep. In different quarters are lobo-wolves and coyotes, red and gray foxes, skunks, wild cats and civet cats. The prairie districts abound in prairie dogs and Texas hares. Among the birds of the state are wild geese and ducks, mainly in the E. portions and on the coast, while farther W. the plover, curlew, snipe, and Mexican canary prevail. The quail, wild turkey, crow, hawk, owl, and mocking bird are widely distributed. The commonest reptiles are the alligator, horned toad, and snakes of various kinds, the only dangerous ones being the copperhead and rattlesnake. Two hundred and thirty species of fishes have been distinguished, most of them in the rivers of the Coast Prairie. The finest is the black bass. Among the invertebrates are the lobster, shrimp, crab, centipede, and tarantula, while along the coast are found oysters and clams in abundance. The principal crops in order of importance are cotton, corn, wheat, oats, and hay. Texas produces nearly twenty-five per cent of the cotton of the U. S. The total value of the farm animals exceeds $150,000,000. In the NE. and E. part there is a fair amount of humidity, but the SW. and W. are too arid for successful agriculture without irrigation.

Principal cities and towns are: San Antonio, Houston, Dallas, Galveston, Fort Worth, Austin, Waco, El Paso, Laredo, Denison, Sherman, Beaumont, Paris, Corsicana, Palestine, Tyler, Gainesville, Marshall, Cleburne, Temple, Greenville, Terrell, Brownsville, Brenham, Hillsboro, Texarkana, Bonham. The system of public instruction includes common schools, high schools, the Sam Houston Normal Institute for whites at Huntsville, the Prairie View State Normal School for colored students near Hempstead, the Agricultural and Mechanical College at Bryan, and the State Univ., which has the departments of literature, science, arts, and law at Austin, and that of medicine at Galveston.

It is believed that the coast of Texas was reached in 1528 by Cabeza de Vaca, but the first European settlement within the present limits was planted by René Robert Cavelier, February, 1685, on the Lavaca River, and was named Fort St. Louis. Previous to this the country had been occupied only by scattered Indian tribes. In 1689 the Viceroy of Mexico sent a small force against the new colony, but the Indians had already stamped it out. In 1691 Don Domingo Teran, Governor of Coahuila and Texas, planted several settlements in the latter province, but none survived long. In 1714 Crozat, to whom Louis XIV had granted Louisiana, sent Huchereau Saint-Denis through Texas to the Rio Grande to ascertain the trading possibilities. This roused the Spaniards to secure possession of Texas. In 1715 they established missions in the province, among them that of San Antonio de Valero, afterwards moved to the famous mission house known as the Alamo. From this time the hold of Spain on Texas was secure as against France, though the latter continued to assert its claims. In 1729 the Spanish Govt. tried to colonize the country, but the attempt failed. In 1735 the French planted a settlement on the W. bank of Red River, and the Spaniards protested; but an official investigation made in Mexico tended to show that the settlement was on French territory. In 1762 France ceded Louisiana to Spain, and in 1800 Spain gave it back to France.

The establishment of the independence of the U. S. was followed by a controversy as to the boundaries between it and the Spanish territory, and the sale of Louisiana to the U. S. in 1803 made it necessary to define the E. boundary of Mexico. Spain strengthened her forces in Texas, and in 1806 a conflict between the Spanish troops and those of the U. S. E. of the Sabine River was prevented only by an agreement between the opposing generals to recognize the strip between the Sabine and the Arroyo Hondo, a little farther E., as neutral ground. In 1819 the Sabine was agreed on as the E. limit of Mexico. During 1821–34 SE. Texas, except the part adjacent to the Mexican border, was settled by colonists from the U. S. The most important colony was that brought by Stephen F. Austin to the lower Colorado and the Brazos. The Anglo-Americans soon became so numerous in Texas as to excite the jealousy of the Mexicans. The province had been joined to Coahuila, and the whole was governed unsatisfactorily to the colonists. In 1830 further immigration from the U. S. was prohibited by the Mexican Congress. In 1833 the Texans sought to obtain a separate state government, but Santa Anna would not consent. In 1835 Texas revolted. A provisional government was organized and a war followed, which was ended by the rout of the Mexican army at San Jacinto, April 21, 1836. On March 2, 1836, Texas declared its independence, and on September 2d it adopted a republican constitution. Sam Houston was chosen president, and an almost unanimous vote was cast in favor of annexation to the U. S. The measure was then checked by Pres. Van Buren's declining the proposition, and it failed again in 1844 because the anti-slavery sentiment and the fact that annexation meant war with Mexico prevented confirmation by the Senate. In 1845, under Polk, who had been elected on a platform favoring annexation, Texas was annexed, not by treaty, but by a joint resolution of Congress. War with Mexico followed. The Treaty of Guadalupe Hidalgo in 1848 established the Texas claim to the strip between the Nueces and the Rio Grande, previously claimed by both Texas and Mexico. In 1861 Texas seceded from the Union and joined the Confederate states. From June, 1865, to March, 1867, the state was under a provisional government, and from the latter date to September, 1869, under military administration. After this it was restored to its place in the Union.

Texas, Univer'sity of, a coeducational institution comprising departments in Austin, Galveston, and Bryan, provided for by the constitution of the Republic of Texas. The Congress of 1839 provided for the selection of a site for a university, and when Austin was located as the capital of the state, forty acres of land in that city were designated for the seat of the university. This action of the republic was followed by a grant of 221,400 acres of land for the "establishment and endowment of two colleges or universities"; and in 1858 the state appropriated to the university $100,000 in U. S. bonds then in the state treasury, and confirmed to it the fifty leagues grant of the republic. In 1883 the legislature granted another million acres of land to the university. The main university establishment, embracing the academic and law departments, was located at Austin in accordance with a vote of the people of the state in 1881, and was opened by the admission of students, September 15, 1883, when rooms were provided for the purpose in the temporary capitol, and used till the university building was finished and occupied, January 1, 1884. The medical department, located at Galveston in 1881, was formally opened in October, 1891. The Agricultural and Mechanical College at Bryan, which had been in operation many years before the university was organized, and which, under the federal grant of 1862 for establishing agricultural colleges in the several states, was a beneficiary of the general government, was made a branch of the university by the state convention of 1876 in order that it might also have the benefit of appropriations from the university fund. The medical department at Galveston embraces the Medical College, which cost about $125,000, and the John Sealy Hospital, valued at $70,000, the latter having been originally willed to the city by John Sealy, a citizen of that place, and transferred to the university. In 1909 the university had 88 instructors, 2,573 students, and a library of 68,456 volumes.

Tex'tile Fab'rics, fabrics made by weaving threads in a loom. The threads usually employed are those made by spinning from vegetable fiber, such as that of hemp, flax, cotton, and many plants with fibrous leaves, especially common in the tropics; of animal fiber, such as wool of sheep, the hair of many varieties of goat, the llama, the camel, the horse, and other beasts; and of the threads spun by the silkworm. A few exceptional fabrics have been woven from the thread of a spider, also from *byssus*, or the silky filaments attached to the bivalve shell, *Pinna flabellum*. Glass has been spun into threads and woven. Wire, as of silver and silver gilt, has been woven into cloth with other materials, as linen and silk, for ornament, and gilded paper cut into slender strips is used for the same purpose. Feathers also have been woven into fabrics.

Simply woven goods are those in which one thread of the weft or woof passes across the width of the web, passing alternately above and below the threads of the warp, one at a time. Examples are common linen and cotton goods, such as are used for under garments or sheets. Linen cloth or linen is the common name for cloth made from flax. Cambric or linen cambric is a fine and close-woven material for handkerchiefs and for different articles of dress; batiste is a still finer cambric; dimity is a thin cotton fabric, usually ornamented in weaving by raised stripes or printed figures; crash, canvas, duck, and sailcloth are all stouter cloths, made originally of linen or hemp, although now more commonly of cotton. Other cotton goods of plain weave, besides cotton cambric, etc., are the cloth which is called in Great Britain calico and in the U. S. more commonly muslin, except when printed in colors, and muslin proper, a cloth which is either the fine hand-woven stuff of India or its European imitation. Woolen cloths and those of silk and wool or cotton and wool are also frequently of simple weave. Such are many blankets and flannels, the stuff called challis, which is usually printed in colors and the dress material formerly called mousseline de laine. The patterns in simply woven stuffs must be either plain stripes, or stripes which when crossing each other form plaids, or "polka spots," or other plain figures. When the threads are slightly bunched together, so that three parallel threads of the woof which have been separately alternating with those of the web are gathered into one strand and alternate with another similar strand made up of three threads of the warp, there is produced a square of coarser weave, giving a decided pattern to the surface. In like manner, especially in silk weaving, threads are bunched together for the whole fabric, producing "basket weave," or an appearance of silky softness is got by bunching the threads lying in one direction, and holding these together by fine strong threads the other way, as in some silk blankets. A twill or a twilled fabric is one in which a thread of the woof is carried over and then under several threads of the warp at one time. This produces in the simple forms a kind of diagonal striping characteristic of the stuffs ordinarily called twill. Scotch tartan plaids, the soft India shawls called Rampoor Chuddahs, most linen diaper, tweeds and cheviots and serges, are examples of twilled fabrics. Satin is nothing more than a twill, the threads which lie side by side and form the surface being very soft, with a silky luster. Twilled fabrics are much stronger than those simply woven, and it is much easier in these to produce elaborate patterns on the surface, whether in different colors or by the mere arranging of the threads so as to catch the light. Linen damask, for instance, such as is used for tablecloths, has commonly a pattern, the principal threads of which lie in one direction, while those of the background lie in the contrary direction. Crape is the general name of material made of threads twisted in reverse directions, so that the surface of the stuff is crimped and blistered. Ordinary silk crape, a thin and gauzy textile, is dyed black and used for mourning garments in Europe, but is printed in bright colors in the East. Canton crape is a thicker and softer silk textile. Crêpon is a similar fabric made of woolen or other thread much heavier than crape. Perhaps the most important variety of weave is that which produces goods having a pile, such as velvet, velveteen, and fustian; also corduroy, which is merely velveteen or fustian in lengthwise ribs.

Thack'eray, William Makepeace, 1811–63; English novelist; b. Calcutta. He was sent to England in 1816; educated at Charterhouse School, and at Trinity College, Cambridge (1829–30), but left without taking a degree. At Cambridge he edited *The Snob*, a weekly undergraduate paper, in which he printed a parody on Tennyson's prize poem, "Timbuctoo." He then traveled and studied on the Continent, especially in Italy, with a view to becoming a painter; spent a season (1830–31) in Weimar, enjoying free access to the ducal courts and becoming intimate with the aged Goethe and his circle. In 1831 he took up his residence in the Temple, and began to read law; but in 1832 he went to Paris, in which city he continued to be as much at home as in London for the next ten years. He had inherited about £20,000, which he lost in an Indian bank and in journalistic speculations, and by 1837 he began to devote himself seriously to literature.

He became a correspondent of *The Times*; wrote humorous papers for *The New Monthly Magazine*, for *Fraser*, and for *Punch* over a variety of signatures, such as "Michael Angelo Titmarsh" and "The Fat Contributor"; published collections of his magazine articles with original illustrations, as "The Paris Sketch Book, by Mr. Titmarsh"; "Comic Tales and Sketches," including the "Yellowplush Papers"; "The Irish Sketch Book." He visited the East in 1845, and published "Notes of a Journey from Cornhill to Grand Cairo"; was first recognized as a literary celebrity upon the publication of his novel, "Vanity Fair." He was called to the bar, 1848, but never practiced; availed himself of his recently acquired popularity to issue several small volumes made up from earlier articles; brought out in monthly parts his second novel, "The History of Pendennis," which confirmed his already high reputation, and made him in popular estimation a rival of Dickens for the first place in modern English fiction; lectured with brilliant success on the "English Humorists of the Eighteenth Century," in London, 1851, and in the U. S., 1852; published "The History of Henry Esmond" (1852), "The Newcomes" (1853–55), and "The Virginians" (1857–59), completing the series of his five really great novels; lectured in the U. S., 1855–56, and afterwards in England, on "The Four Georges"; presented himself unsuccessfully as a Liberal candidate for the representation of the city of Oxford in Parliament, 1857; founded *The Cornhill Magazine* (1859), in which he published his two latest novels, "Lovel the Widower" and "The Adventures of Philip," both inferior to his earlier productions, and a series of articles collected as "Roundabout Papers" (1862), and resigned his editorship, 1862.

A great part of his life was saddened by the insanity of his wife, who survived till 1894. Thackeray has been variously described as a realist and a caricaturist, a cynic and a sentimentalist. Beginning with burlesque, satirical character sketches, and all manner of humorous skits and broadly comical drolleries, he gradually widened his field and refined his method until in his great novels he was able to draw a picture of English life, and especially of the life of town, society, and the upper classes, which, while brilliant as satire, included the tragic as well as the comic elements, and in truth to nature was superior to the work of his great rival and counterpart, Dickens. He left an unfinished novel, "Denis Duval," printed in 1867.

Tha'is, an Athenian courtesan, as celebrated for her wit as for her beauty. She accompanied Alexander the Great on his expedition into Asia, and is said to have instigated him, during a festival at Persepolis, to set fire to the palace of the Persian kings in revenge for the calamities which Xerxes had brought on her native city.

Thaler (tä'lėr), till 1871 the monetary unit for N. Germany, worth about seventy-three cents. See DOLLAR.

Thales (thā'lēz), abt. 636–546 B.C.; the earliest Greek philosopher, and one of the seven wise men; b. Miletus, Ionia. Various physical discoveries are attributed to him. He is said to have computed the sun's orbit, to have fixed the length of the year at 365 days, and to have been the first among the Greeks to predict eclipses. Philosophical language being then uninvented, he defined his abstract, universal ground of things as *water*, being led to this perhaps by observing that all nourishment contained moisture. Aristotle calls him the originator of the Ionic natural philosophy, and hence, indirectly, of Greek philosophy in general.

Thali'a, in Greek mythology, one of the nine muses. She presided over comedy, idyllic and bucolic poetry, and her attributes are the ivy crown, the comic mask, and the shepherd's staff.

Thal'lium, one of the rarer elements, a metal discovered almost simultaneously in 1861 by Lamy in France and Crookes in England, by means of the spectroscope, in which it gives a bright green line. It is found in iron and copper pyrites and with sulphur. Thallium

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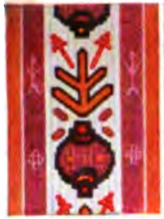
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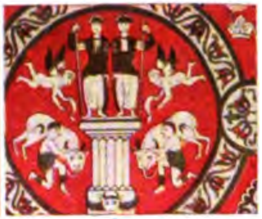
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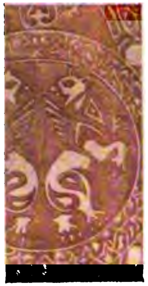
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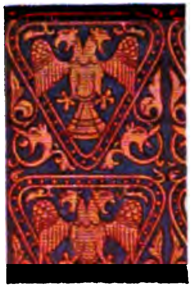
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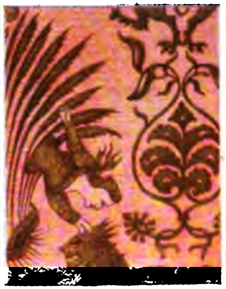
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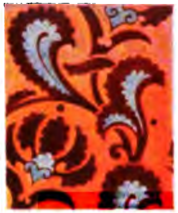
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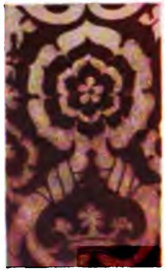
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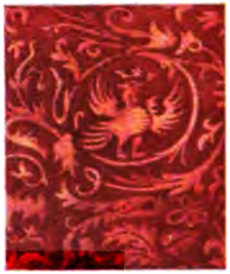
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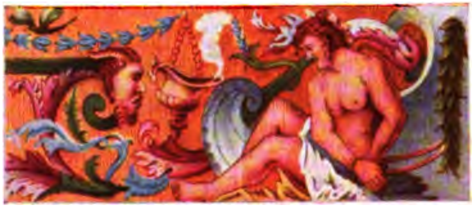
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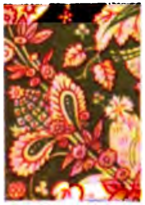
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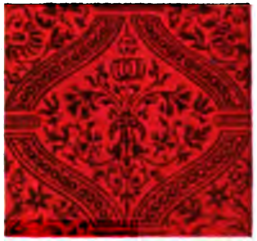
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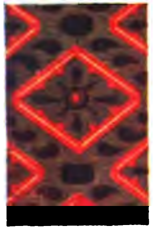
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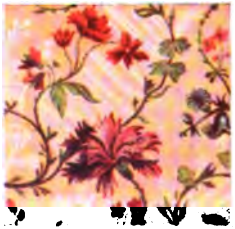
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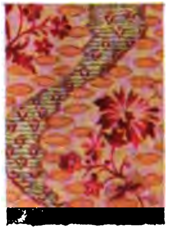
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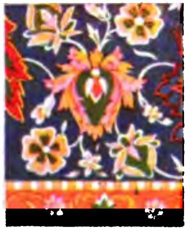
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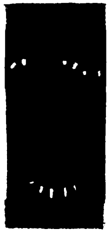
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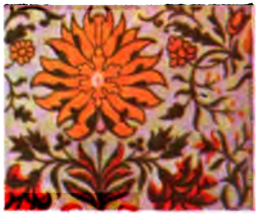
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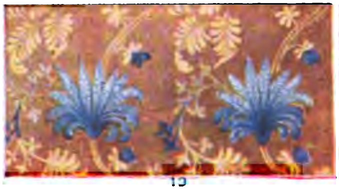
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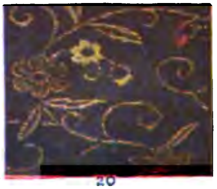
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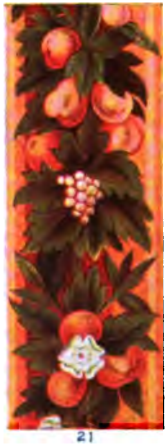
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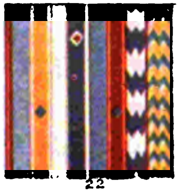
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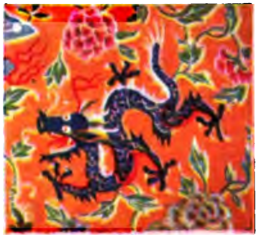
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1. Old Egyptian Pattern
2. Roman Fabric (400 years after Christ)
3. Silk Fabric of the Tunic of Henry II (11th century)
4. Byzantine Material (12th century)
5. Italian Silk Fabric (13th century)
6. Velvet (15th century)
7. Velvet (15th century)
8. Velvet (15th century)
9. Velvet (16th century)
10. French Gobelin (17th century)
11. Silk Fabric (17th century)
12. Burgundian Velvet (16th century)
13. Velvet (16th century)
14. French Silk Fabric (18th century)
15. French Material of Silk and Wool (18th century)
16. Persian Carpet (16th century)
17. Old Arabic Fabric
18. Silk (17th century)
19. Silk (18th century)
20. Japanese Fabric
21. Gobelin (16th century)
22. Indian Cotton Carpet
23. Border of a Cashmere Shawl
24. Chinese Silk Fabric

M70U

is nearly as white as silver, softer than lead, and with no elasticity. Its salts are highly poisonous, and some of them, like silver salts, are sensitive to light.

Thal'lophytes, or **Thalloph'yta,** a general term applied in botany to the plants below the mossworts, and including the protophytes, phycophytes, and carpophytes. Originally the group of the thallophytes was made coördinate with the cormophytes ("stemmed plants"), the two including the whole vegetable kingdom, but in recent years it has been made the lowest of the four branches, anthophytes (flowering plants), pteridophytes (fernworts), bryophytes (mossworts), thallophytes (thallus plants). While the term is a convenient one to use, it does not represent a natural group of plants, but rather an aggregation of groups.

Thames (tĕmz), the principal river of England. It rises on the SE. side of the Cotswold Hills near Cirencester, 376 ft. above the sea level, and flows E. to the North Sea, passing Oxford, Reading, Henley, Windsor, Eton, and Richmond on its way to London. It is called the Isis up to its junction with the Thame. The tide ascends as far as Teddington, between Eton and Richmond, and from this point up to Oxford there are thirty-three locks. At London Bridge its width is 290 yds.; at Woolwich, 490 yds.; at Gravesend, 800 yds.; three miles below Gravesend it expands into a large estuary, 6 m. broad at its mouth, at the Nore Light. Its entire course is about 250 m., and it is navigable for vessels of 1,400 tons burden up to Blackwall, 6 m. below London Bridge, and barges may ascend as far as 200 m. from the mouth. It owes its importance as a waterway to its tidal estuary and to the fact that it has no delta. Its principal affluents are the Coln, Leach, Windrush, Cherwell, Thame, Colne, Lea, and Roding on the left bank, and on the right the Kennet, Loddon, Darent, Mole, and Medway. Above London the scenery is interesting, and the river is studded with numerous islands. Through a vast system of canals it communicates with the S. and W. coasts.

Thames, a river of Ontario, Canada, in the peninsula between lakes Huron and Erie, flowing SW. about 160 m. into Lake St. Clair. It is navigable for small vessels to Chatham, 18 m. At the Moravian settlement on this river, October 5, 1813, the battle of the Thames was fought between the British under Gen. Proctor, with 2,000 Indians led by Tecumseh, and the Americans under Gen. Harrison. The American cavalry, commanded by Col. Richard M. Johnson, opened the battle and defeated the enemy. Tecumseh was killed, and 600 prisoners, six pieces of cannon, and large quantities of stores were taken by the Americans.

Thane, or **Thegn** (thān), the title among the Anglo-Saxons and early Normans of certain military tenants and freeholders in the king's service. They were originally the servants of the king, and became a new nobility, supplanting the older nobility of birth, the earls. As a nobility of office, it made it possible for the simple freeman to rise to noble rank. The churl who owned five hides of land or had taken three sea voyages was eligible to thanehood and had a voice in the witenagemot. After the Norman Conquest the thanes were gradually merged in the barons.

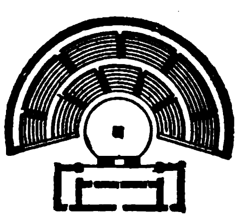
Than'et, Isle of, the NE. extremity of the county of Kent, England, separated from the mainland by the river Stour and the Nethergong Rivulet; area, 26,180 acres. The surface is level and the soil fertile, though light. It contains the watering places Ramsgate, Margate, Westgate, and Broadstairs.

Thanksgiv'ing Day, an annual religious festival in the U. S. It originated in 1621, when Governor Bradford of the Plymouth Colony appointed a day for public praise and prayer after the first harvest. The practice was observed by the other New England colonies, and during the Revolution was introduced in the middle states. Since then it has extended to nearly all the states, and has been a national institution since 1863. The day, which is usually the fourth Thursday of November, is designated by a proclamation signed by the governor or the President.

Tha'sos, island in the Ægean Sea; 5 m. S. of the mainland; since 1462 belonging to Turkey. Area, 85 sq. m. The island has gold mines not worked since antiquity; is the most fertile and least visited by foreigners of all the Greek islands; and in dress and customs its inhabitants have been the least affected by modern innovations. Ruins of ancient and mediæval monuments abound. Pop. abt. 12,000, all Greeks—simple, unambitious, and prosperous—living in nine villages.

The'ater, specifically, any structure erected for dramatic or operatic performances, the present form being a modification of the model first established by the Greeks before 500 B.C.

In the very earliest days the Athenian dramas were performed upon temporary wooden scaffoldings, prototypes of the booths of mediæval times, which were put up for the festivals of Dionysus and then laid aside for future use. It was upon such a scaffolding that the first acted drama of Æschylus was produced, and the collapse of the structure during the performance, an accident regarded as an evil omen, suggested the construction of a more durable edifice. The first stone theater was begun soon afterwards on the SE. slope of the Acropolis, and it is a noteworthy fact that the plans were drawn with such skill and foresight, such exact appreciation of acoustic and spectacular requirements, that none of the architects of succeeding generations was able to suggest any important improvement upon them. In all the ruins of theaters extant in Greece, Asia Minor, and Sicily the same arrangement is observable. All Greek theaters were built either upon eminences or on the side of a hill, and in every case


PLAN OF GREEK THEATER.

the spectators occupied the upper or NW. and the stage the lower or SE. part of the structure. As the performances occurred at comparatively long intervals, and were originally in the nature of religious festivals, it was necessary to provide accommodation for great crowds, and some of the largest theaters held 70,000 or 80,000 people. The acoustic qualities of the auditorium were thus the last to receive attention, and the actors were compelled to adopt a slow method of elocution and to use mechanical devices in their masks, like megaphones. Originally, the most important part of the Greek theater was the orchestra, the central space devoted to the movements of the chorus, out of which the drama ultimately grew. It was a little lower than the lowest row of seats or benches surrounding it, and was boarded over. In the center of it, equidistant from the rear of the stage and from all other points of its circumference, stood the altar of Dionysus. The approaches to the seats were mainly through underground passages. There was no roof, although awnings were later introduced. Little is known as to the scenery, although there was a certain amount of machinery, including one device for bringing a god down from the sky or up from the infernal regions. To add to their stature, Greek actors wore high-heeled boots (*cothurnus*); they were padded so extravagantly that free movement was not to be thought of; their faces were hidden behind masks, and they chanted their lines through a metal contrivance like a speaking trumpet. The performances, which always included a series of plays, often lasted from sunrise until sunset. The places of honor were in the lowest rows of benches, where the magistrates and military and social magnates and illustrious strangers sat. Above them were the senators, then the *ephebi*, then the general public. The average rate of admission was about two obols, or six cents. Pericles passed a law which conferred the right of free admission upon the poor. The expenses of the representations were defrayed by wealthy citizens and by state subvention.

The Roman theaters were built upon the model of the Greek, but had no altar or provision for a chorus. The stage as we know it dates from the old miracle plays or mysteries, performed in churches, booths, or the courtyards of inns. The earliest London theaters were inclosed yards, octagonal or nearly circular in shape and roofless, except over the stage, which continued to give shelter to the fashionable theater goers until Voltaire, in France, set the example of driving them into the boxes. The green room, or "tireynge house," was on one side of the stage, and the roof of it was often surrendered to the audience. The first playhouse in London was the theater erected by James Burbage in 1576–77, and the next the Curtain Theater, in Shoreditch. Burbage built the Globe, of Shakespearean fame, in 1598, and in the same decade Henslowe opened the Rose and the Swan. Among other contemporary houses were the Blackfriars, the Red Bull, the Hope, the Whitefriars, and the more famous Fortune of Edward Alleyn, which lasted from 1600 to 1819.

The invention of movable scenery dates from the seventeenth century. In the modern theater the spaces on either side of the stage are known technically as the wings, and these originally contained all the scenery (flats), which was pushed forward as required, running in grooves. There is a space above the stage as high again as the proscenium arch, known as the flies, while below the stage there is an excavation called the dock. The double stage (of which the first example was constructed in the Madison Square Theater, of New York) is useful when a succession of elaborate interiors is to be presented, but it occupies much space, and has other disadvantages which has prevented its general adoption. The advance in the art of stage illusion has been great. Thunder is counterfeited by iron balls or sheets of tin. The use of electricity has made real lightning possible in storms, and the noise of rain and wind is simulated by the use of a cogged cylinder revolving against tightly stretched cloth. Formerly lightning was simulated by flashes of lycopodium and the noise of rain by parched peas in a metal cylinder. Wagner, at Bayreuth, first used steam for magical and other effects, and water is most faithfully represented by mirrors in which scenery is reflected. Until 1720 dip candles were used for footlights, but were replaced by lamps with Argand burners. Gas followed in 1822, and now yields to electricity.

For purposes of directions to actors, scene shifters, etc., the stage is divided into five lateral strips, which, beginning from the left-hand side as the spectator faces it, are denominated the "prompt side" (from the position of the prompter, who no longer occupies a box in the very center of the footlights, except in opera and in continental theaters), "prompt center," "center," "opposite prompt center," "opposite prompt side." These titles are abbreviated into "P. S.," "P. C.," "C.," "O. P. C.," and "O. P. S." The various entrances for actors in the wings, counting from the front of the stage, are called the first, second, and third entrances, left or right, as the case may be. Doors in the rear of the stage are described as center and left or right center (back), according to position. The dangers from fire in a modern theater are very small, although the terrible disaster at Chicago in 1903, when the burning of the Iroquois Theater resulted in the loss of over 600 lives, shows that every precaution of fireproof construction and fire-resisting material must be observed. The largest theaters in the U. S. are the Metropolitan Opera House, New York, with a seating capacity of 3,336, and the Auditorium, Chicago. In Europe, La Scala, in Milan, and the San Carlo, in Naples, have each a seating capacity of 5,000.

The'bais or the **Thebaid**, ancient name of S. or Upper Egypt, from its capital, Thebes.

Thebes (thēbz), a city of Egypt on both sides of the Nile. After the desertion of Memphis by the princes of the seventh to the tenth Egyptian dynasties, due possibly to a foreign invasion, Thebes became the capital of Egypt, and so continued during the middle and new kingdoms. The city proper was on the E. side of the Nile, and is now represented by the ruins of several temples, those of Karnak and Luxor being the chief. The W. side of the river was occupied by the Theban necropolis and various temples. The temples, beginning toward the N., were those of Gurnah, the Ramesseum (built by Rameses II), Dêr el-Medîneh (founded by Ptolemy IV and continued down to the time of Augustus, dedicated to Hathor), and Medînet Habu. There was also formerly a temple of Amenhotep III (the Memnon of the Greeks) adjacent to the Colossi of Memnon, but it has almost entirely disappeared. The cemeteries include the Tombs of the Kings, in a valley W. of Dêr el-Bahri, and the Tombs of the Queens, W. of Medînet Habu. It was in the hills W. of Dêr el-Bahri that the mummies of the Pharaohs of the seventeenth to the twentieth dynasties were discovered in 1881.

The Libyan hills are honeycombed with tombs. The residence portion of Thebes was to the E. of the temple of Karnak, though it is estimated that about a quarter of the population, consisting of priests and artisans whose employments were of a funerary character, dwelt in the necropolis on the W. The city goes back probably to the Old Kingdom, though at that time it was insignificant. Its prominence dates from the eleventh and twelfth dynasties, when more extensive building operations were begun. During the Hyksos period it was the seat of native princes tributary to the invaders, and it so continued till the seventeenth dynasty, when a revolt occurred, occasioned by religious demands made upon Seqen-Ra, King of Thebes, by Apepi, the Hyksos ruler. War was waged during several reigns, till at last the Egyptian armies were victorious. Thebes became the national capital again and Amon-Ra, the tutelary deity of Thebes, became the supreme god in the Egyptian pantheon. The kings of the eighteenth and nineteenth dynasties, especially Thothmes III and Rameses II, were active in building at Thebes, and the history of the city is largely a history of these dynasties.

During the reign of Amenophis IV, the "heretic king," the capital was temporarily removed to Tell el-Amarna, but the power of the priests of Amon was too great for the innovator, and the old régime was speedily restored. After the close of the twentieth dynasty the seat of government was removed to the delta, and Thebes gradually lost its power, though it was twice the source of insurrections, which were subdued only by the aid of the Romans. Its final destruction as a political power occurred in 85 B.C. The sanctity of Thebes, the "On of the South" as contrasted with "On Heliopolis," at the apex of the delta, arose from the fact that it was reputed to have been the birthplace of Osiris, but it was inferior to Abydos, the burial place of Osiris, and Heliopolis, the city of the Sun, in the religious estimation of the people. Its wealth and power were due to the spoils of war taken thither by the warlike Pharaohs of the eighteenth and nineteenth dynasties. The epithet "hundred-gated" applied by the Greeks to Thebes had reference to the multitude of pylons which marked the entrances to its numerous temples.

Thebes, capital city of Bœotia; founded by Cadmus in a fertile, well-watered, and undulating plain. The city was very prominent in mythical times, for many of the most important and most extensive myths were located there. Its walls and their seven gates were built by Amphion, and were taken but twice—once in mythical times by the Epigoni of the Seven and then by Alexander the Great. Thebes was usually hostile to Athens, but she never fought with success or rose to first-rate importance till after the battle of Leuctra, when she assumed the hegemony of Greece, though she maintained it only during the lifetime of Epaminondas. She was unfortunate in her wars with Philip of Macedon, who placed a garrison within her citadel. On the death of Philip she expelled this garrison, but was punished therefor by Alexander, who razed the city, sparing only the temples and the house of Pindar, and sold the inhabitants into slavery. Phryne offered to rebuild the walls, but her offer was declined. The city was rebuilt by Cassander with the help of the Athenians, but it did not prosper. The modern town has about 5,000 inhabitants. It was virtually destroyed by an earthquake in 1893.

Thec'la, Saint, according to legend, a virgin of Antioch, enthusiastically attached to the Apostle Paul, by whom she was converted to Christianity and strict celibacy. She maintained her faith in Christ amid persecutions, public and private, and was miraculously delivered from assaults upon her virtue. "The Acts of Paul and Thecla" is a widely circulated Christian romance of the second or third century, designed to exalt celibacy.

The'ine, the alkaloid of tea and coffee. See CAFFEINE and TEA.

The'ism, in the widest acceptation, the doctrine of a divine being. As such it may be deistic, pantheistic, or polytheistic. In later usage theism indicates a belief in God not derived from supernatural revelation and not specifically Christian. The god of deism (see DEISTS) was a god outside the world and leaving it to go alone, or governed by natural laws. The god of theism is a principle of life and order, never ceasing from his operations, his laws not delegated forces, but the constant habits of his activity. On the physical side theism has allied itself with the doctrine of evolution. During the transcendental period in the U. S. deism was contemned as resting on the argument from design, while theism was glorified as the doctrine of conscience and direct intuition. See DEISTS; POLYTHEISM; PANTHEISM.

Theiss (tīs), a river of Hungary; formed by the junction of the Black and White Theiss, both of which rise in the Carpathians; flows with a winding S. course to the Danube, which it joins 22 m. E. of Peterwardein. Its entire length is 828 m., for the greatest part of which it is navigable. After entering the Hungarian plain its breadth is from 400 to 800 ft., its shores low and marshy, and its current sluggish. It is rich in fish, especially sturgeon.

The'mis, a daughter of Uranus and Gæa, and the second wife of Zeus, by whom she became the mother of the Horæ and the Mœræ. She is the personification of law and order as established by custom and equity. She presides over the assemblies of men, and sees to it that their deliberations make for order and justice. In art her features resemble those of Athene, but she carries a cornucopia and a pair of scales, to typify the blessings that result from law and order.

Themistocles (thĕ-mĭs'tō-klēz), abt. 514–449 B.C.; Athenian general. After the exile of Aristides in 483 he was the chief political leader in Athens, and his main endeavor was to make it a great naval power. On the invasion of Xerxes he induced the Athenians to abandon their city and remove mainly to Salamis, where the whole naval force of Greece was gathered. It was only by his influence that the fleet was kept together, and the naval battle was fought which resulted in a complete victory for the Greeks. When the Athenians returned to their city, through his influence and management the fortifications were rebuilt on an enlarged scale and the three harbors were inclosed by a wall nearly 7 m. in circuit. His political ascendency soon declined, and about 471 he was ostracized and went into exile at Argos, and then fled to Persia, where, according to some accounts, he excited Artaxerxes with delusive plans for the subjugation of Greece, and finally poisoned himself.

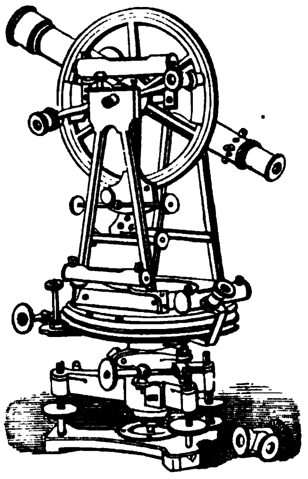
He was impetuous and shrewd, sagacious in his judgment of actual circumstances and their probable consequences, swift in arriving at a resolution, inexhaustible in devices for the realization of his plans, possessed of a most impressive eloquence, energetic, cunning, and unscrupulous. His actions show a blending of rank ambition and lofty statesmanship, of egotism sometimes even sordid, and an elevation of mind truly noble, which becomes the more inexplicable the better known his ways and means become. Nevertheless, in a most decisive crisis he was the savior of Athens and Greece.

Thenard's' Blue. See COBALT.

Theobro'mine, an organic base present in cacao beans, and therefore in chocolate.

Theoc'ritus, flourished abt. 270 B.C.; b. Syracuse. He was the creator of pastoral poetry as a department of literature. There are, under his name, thirty-one poems, besides epigrams. He wrote in Syracusan Doric, and combined consummate artistry with an intimate love of nature.

Theod'olite, a surveying instrument for measuring vertical and horizontal angles and taking levels, combining the uses of the ordinary engineer's transit, the quadrant, and the level. In the American form of the instrument the telescope turns over and the vertical angles are read on a graduated circle. In the English form the vertical angles are read on a semicircle beneath the telescope and level; the telescope cannot, therefore, turn over, but is reversible. The American form is preferable by reason of the greater facility and precision of the adjustments. When used for important surveys the circles are 30 in. or more in diameter; in smaller instruments they are 5 or 6 in. See HYPSOMETRY.



THEODOLITE.

Theodo'ra, abt. 508–548; Byzantine empress; b. either at Cyprus or Constantinople; daughter of Acacius, master of bears to the Green Faction. She appeared on the stage as a pantomimic dancer, an occupation held in general contempt. In the "Anecdota," attributed to Procopius, scandalous stories are narrated of Theodora's youth. In 525, when she married the consul Justinian, she was but seventeen years old; hence some of the charges against her cannot possibly be true. In 527 Justinian succeeded to the throne. He required public functionaries to swear allegiance to Theodora as well as to himself, caused her effigy to appear on the coins with his own, and cited both their names in public decrees as joint rulers. During twenty-three years she showed herself his worthy consort. Her courage and judicious counsels prevented his deposition at the revolt of the Nika in 532, and in all questions of administration she took a notable share. No female sovereign manifested larger interest in the unfortunate and destitute of her own sex or strove more earnestly to alleviate their condition. She retained her ascendency over Justinian to the last. Theodora was of small stature, pale, delicate, vivacious, graceful rather than beautiful, had expressive eyes, and was fascinating in manner. She died of cancer at Pythia, near Brusa, whither she had gone for the baths.

Theod'oric (German, DIETRICH), surnamed the Great, abt. 455–526; king of the Ostrogoths; b. Pannonia. He was brought up at the court of Constantinople, and succeeded his father Theudemir as king in 475. He was alternately an ally and enemy of the emperor Zeno the Isaurian, whose territories he ravaged, and who to get rid of him suggested the conquest of Italy. In 488 Theodoric marched thither at the head of his whole people, amounting to about 200,000, repeatedly defeated Odoacer, captured him after three years' siege in Ravenna (493), had him assassinated, and firmly established the Gothic power over the whole peninsula by partitioning one third of it among his warriors. He fostered industry, literature, and the arts. The Arians, to which sect he belonged, being persecuted in the East, he retaliated against the Catholics of Italy. In a moment of passion he ordered the execution of Boethius and Symmachus, and died at

Ravenna just after he had issued a decree giving the churches of Italy to the Arians.

Theodo'sius, a Roman general from whom a line of emperors descended. Sent to Britain in 367 A.D., he drove out the Picts and Scots, strengthened the frontiers, and restored order in the country. After his return he was on the upper Danube, where he defeated the Alemanni. In 372 he took command in Africa, and put down a revolt led by the Moorish chieftain Firmus. Theodosius was executed in 376 by order of Valens.

His son, Theodosius I, the Great, Roman Emperor from 379 to 395, b. probably at Cauca, in Galicia, abt. 346, and educated in his father's camp. He early received an independent command in Mœsia, and distinguished himself over the Sarmatians, but after the execution of his father he retired from public life. After the defeat and death of Valens in the battle of Adrianople (378), Gratian recalled him to the court, made him commander in chief against the Goths, and declared him Augustus (January 19, 379), placing Egypt, Asia, Thrace, Macedonia, and Dacia under his scepter. Theodosius pursued a skillful policy against the Goths, and a peace was concluded by which they received lands within the empire and became allies of Rome. In 383 Gratian was defeated and killed by Maximus at Lyons, and Theodosius acknowledged the usurper as Emperor of Britain, Spain, and Gaul, but secured Africa, Italy, and Illyricum for Gratian's brother, Valentinian II. In 387, however, Maximus broke from Gaul into Italy, and the weak Valentinian II, and his mother Justina, who was the true regent, fled to Theodosius. Theodosius became infatuated with Valentinian's sister Galla, and promised to restore him to the throne in order to obtain her hand. Maximus was defeated and put to death in 388, and Valentinian II was reinstated as Emperor of the West, but in 392 was killed by Arbogastes, who raised the rhetorician Eugenius to the throne.

Theodosius in 394 marched against Eugenius and Arbogastes and defeated them at Aquileia, thereby uniting the whole Roman Empire under his scepter. He died shortly after, however (January 17, 395), at Milan, leaving the empire to his sons Arcadius and Honorius. Theodosius was a zealous upholder of orthodox Christianity, and took active measures for the suppression of pagan rites and heretical opinions. His obedience to the Church was exemplified in his submission to the penance imposed by St. Ambrose after the cruel massacre of Thessalonica (390). His grandson Theodosius II (408–50), b. 401, succeeded his father, Arcadius, as emperor in the East. He was a weak ruler, controlled by his sister Pulcheria and his wife Eudocia. He is chiefly known for the Theodosian code, a collection of the imperial constitutions issued since the time of Constantine.

Theog'nis of Meg'ara, Greek poet; flourished abt. 550 B.C. He was a citizen of Megara, was exiled with the aristocratic party, and survived the Persian War. His elegies show the state of parties and the social problems of his time.

Theol'ogy, the science which treats of God and divine things. Viewed as the whole of religious science, it consists of four main branches: historical; exegetical, to which belongs the interpretation of the Bible; systematic, also called merely theology, which comprises the system of Christian doctrines (dogmatics); and practical or moral theology, which includes homiletics, liturgics, ecclesiastical law, etc. These are again variously subdivided, and several auxiliary sciences are connected with them, such as soteriology, or the doctrine of salvation through Christ; eschatology, or the doctrine of the final state of all men; ecclesiology, or the doctrine of the constitution of the Church, etc. The theologians of the Middle Ages were divided into two fundamental schools—the scholastics and mystics—a distinction traceable also after the Reformation. Kant developed a new theory of Christian theology, commonly called rationalism. Its opponents, who defended the Bible as the absolute rule of faith, were called supernaturalists. The chief arena of this controversy has been Germany. In Roman Catholic schools theology is divided into dogmatic and moral. Moral theologians are often called casuists from their treating of "cases of conscience." See RELIGION; GOD; NATURAL THEOLOGY.

Theophras'tus, Greek philosopher; b. Eresus, in Lesbos; head of the Peripatetic School after the death of Aristotle for thirty-five years (322–287 B.C.). This prosperity was due to the character and ability of the head of the school, who enjoyed the highest esteem. Especially attractive were his discourses on ethical topics, in which he showed the indulgent temper of a man of the world; and in the province of science he eclipsed the botanical work of Aristotle. But the work by which he is best known is his treatise called "Characters." These sketches are taken from the mimic life of the stage, and are of importance for the study of the New Comedy. The book has been imitated scores of times. Especially famous are La Bruyère's companion pieces in French and George Eliot's "Theophrastus Such."

Theos'ophy (the "knowledge of divine things"), a name now applied to the doctrines of the Theosophical Society, founded in 1875 by Mme. H. P. Blavatsky, Col. H. S. Olcott, William Q. Judge, and others, its avowed objects being (1) "to form the nucleus of a Universal Brotherhood of Humanity without any distinctions whatever; (2) to promote the study of ancient and modern religions, philosophies, and sciences; (3) to investigate unexplained laws of nature and the psychical powers of man."

Theosophy is founded upon the doctrines of reincarnation and Karma or justice. It teaches a sevenfold division of the nature of man, the three highest principles — spirit (Atman), discernment (Buddhi), and mind (Manas)—continuing through each rebirth. Much stress is laid upon the so-called occult phenomena and the development of higher psychic powers.

Therapeu'tæ, a sect of Jewish contemplative ascetics, kindred to the Essenes. Their chief seat was on Lake Mareotis, in Egypt. They were of both sexes, strictly observed the Sabbath and other Jewish festivals, were ardent students of the Mosaic law, and claimed to have secret religious knowledge.

Therapeu'tics, Men'tal. See Psychotherapy.

Theresa (tė-rē'sä), or **Teresa de Je'sus, Saint,** 1515–82; b. Avila, Spain, her full name being Teresa Sanchez de Cepeda; entered (November 2, 1536) the Carmelite monastery at Avila, and in 1562 founded a reformed branch of Carmelite nuns. She made a prolonged study of theology and wrote several mystical and ascetic treatises, which are accounted among the Spanish classics, and obtained her a great reputation. Among them are an autobiography giving an account of her interior conflicts and visions, and a mystic description of the heavenly life. She was canonized in 1621.

Ther'mal Springs, or **Hot Springs,** springs having in general a higher temperature than the regions in which they are found, the rise being probably due to contact with heated rocks below the surface. They are usually found in regions where the rocks have undergone great displacement, or where there have been volcanic eruptions. In England the hot springs of Bath have been known since the time of the Romans. In the U. S., Virginia and N. Carolina, Arkansas and S. Dakota, are noted for their hot springs, but the grandest developments are seen in the Yellowstone Park, and in Iceland and New Zealand. Geysers are intermittent hot springs.

Ther'mic Fev'er. See Sunstroke.

Thermidor', the eleventh month of the French republican calendar (July 19th to August 18th).

Ther'mit, a mixture of aluminum and oxide of iron, which when ignited produces aluminum oxide and iron at a very high temperature, near 3000°. It is used to weld metals, to make solid castings, etc.

Thermodynam'ics, the science that treats of transformations of energy involving heat, especially, in its earlier stages, of the transformation of heat energy into mechanical energy (the so-called "development of power"). Thermodynamical principles are involved in all such physical phenomena as the expansion of heated bodies, development of heat by compression, dissociation of gases and of dissolved solids, flow of gases, fusion and evaporation, the influence of temperature on an electric battery, etc. The fundamental principles of the science are usually stated in two laws, each of which assumes a variety of forms whose identity it is often difficult to detect. They are respectively the thermodynamic statements of the principles of Conservation and Dissipation of Energy.

In a common form, the *First Law* simply states that heat is a transformable form of energy, whose mechanical equivalent is constant. According to this law, if a quantity of heat be imparted to a body, its energy is expended in two ways, internally and externally. Internally, the body's temperature is raised, and its state may be changed; externally, the body expands, and does work against atmospheric or other pressure.

The *Second Law* states that to change all the heat in a body into other forms of energy is impossible, and it depends on the experimental fact that heat passes always from a hotter to a colder body; never in the opposite direction. From a consideration of what would happen in an engine of ideal efficiency (one in which the cycle of operations is reversible), it appears that the efficiency of a heat engine (any device for transforming heat into mechanical work) depends on the range of temperatures that may be used; in a steam engine, for instance, on the difference in temperature between the boiler and the condenser. As the passage of heat would involve the equalization of these temperatures if they were not artificially maintained, there is always a great part of the heat that remains incapable of transformation. The second law of thermodynamics is stated in another form by introducing a new conception, that of *eutropy,* which may be defined as the ratio of a minute quantity of heat to the temperature at which it is transferred from one body to another. During such a transfer the temperature of course falls, and eutropy is therefore increased by the transformation. In this way the total eutropy in the universe tends toward a maximum, and when that maximum is reached no more movement of heat will be possible, for everything will be at one dead level of temperature, and there will be no "available" heat left—no possible "development" of power by heat engines. This result is nothing but the dissipation of energy, so far as it applies to the particular form that we recognize as heat.

Thermodynamics deals very largely with the phenomena of the steam engine; and its deductions, especially from the data obtained by the so-called "indicator," giving the varying relations between the volume and pressure of the steam in the cylinder during the stroke, have thrown valuable light on the construction and operation of such engines. See Heat.

Thermoelectric'ity, electricity produced directly by the action of heat; also the branch of electrical science that treats of the direct transformation of heat into electrical energy. If two dissimilar conductors be joined at both ends to form a circuit, and the junctions be kept at different temperatures, an electromotive force will be generated at the junctions and a current will flow around the circuit. With iron and copper the current flows from copper to iron across the warmer junction. By a proper arrangement of such thermoelectric elements, joined in series, a thermoelectric battery may be formed, and several types of such batteries are in use, though not extensively. The electromotive force of a single element or couple is very small, but such a couple may act as a very delicate thermoscope, a slight rise in temperature at one junction producing a current that may be detected by a sensitive galvanometer. This is the principle of the *Thermopile.*

The electromotive force depends not only on the difference of temperature at the junctions, but on their absolute temperatures. For every combination of metals there is a mean temperature at which the electromotive forces at the junctions are equal and opposite, so that no current flows. This is called the *neutral temperature.* For mean temperatures of the two

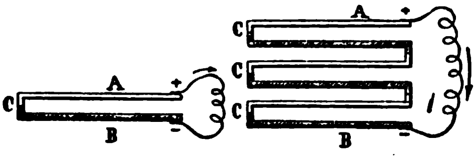


FIG. 1.—THERMOPILE: *A*, Antimony; *B*, bismuth; *C*, copper wire.

junctions above the neutral temperature the current is in the opposite direction from that resulting from a mean temperature below the neutral temperature. This is called *thermoelectric inversion.* For silver and iron the neutral temperature is 223.5° C.; for copper and iron it is 274.5° C. The rate of change of electromotive force with temperature may be represented by a straight line, and a combination of such lines, each representing a different metal, is called a thermoelectric diagram.

The line representing some one metal (lead in the diagram) is arbitrarily taken as the horizontal axis. The point where two lines cross is the neutral point for the two corresponding metals. Thus the copper and iron lines would cross at 274.5°. The electromotive force of a couple is represented on the diagram by the parallelogram included by the corresponding lines between the temperatures of the two junctions. Thus, that of a copper-iron couple at 100° and 200° is proportional to *a b c d.* Peltier discovered in 1834 that, when a current is sent across a thermoelectric junction, the junction is heated or cooled, according to the direction. This phenomenon, known as the *Peltier effect,* is the converse of the fundamental phenomenon of thermoelectricity. Lord Kelvin (Sir William Thomson) discovered that heat is absorbed at points of the circuit other than junctions, when the current passes from hot to cold parts or the opposite. This is called the *Thomson effect.* In copper, heat is absorbed when the current passes from cold to hot parts; in iron, the reverse is the case. Since the current acts in this case like a liquid, electricity is sometimes said to have *specific heat.*

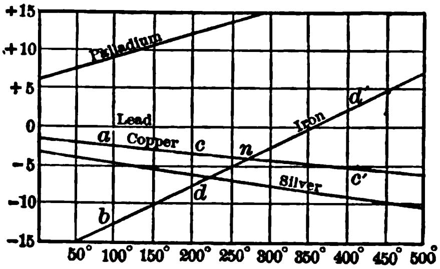


FIG. 2.

Thermom'eter, any instrument for measuring temperature, usually a fine tube containing mercury or colored alcohol, with a bulb at one end and sealed at the other end after all air has been removed. Two fixed points are then marked on the tube, usually the levels of the temperature of melting ice and of boiling water. The intervening portion of the bore is divided into equal degrees according to various scales. As a standard, the air thermometer is sometimes used. The essential parts of the air thermometer are the bulb (B. Fig. 1) and the manometer (M), by means of which the pressure may be regulated and measured. The usual procedure consists in holding the air within the bulb at constant volume, the mercury within the manometer tube being brought always to the same level (*n*). The temperature of the air within the bulb is computed from the pressure necessary to give it the volume in question. At very high temperatures this process has to be abandoned for fear of distending the bulb and changing its volume permanently. For such experiments the pressure is maintained constant, and the volume is allowed to vary. In the measurement of temperatures above 400°, porcelain is substituted for glass on account of its greater refrangibility.

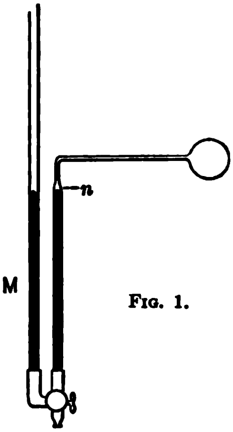


FIG. 1.

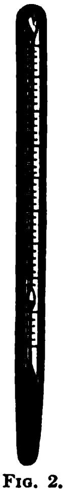


FIG. 2.

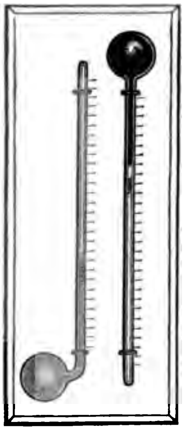


FIG. 3.

Special forms of thermometers are made to adapt the instrument to special purposes. In the clinical thermometer, the stem is shortened between the zero and the range with which one has to do in determining the temperature of the human body, by means of a small subsidiary bulb, as shown in Fig. 2.

Other well-known special forms are the various maximum and minimum thermometers, of which one (Rutherford's) is shown in Fig. 3. The maximum recording device consists of a steel marker, which is pushed along the wide bore in front of the mercury column, and is left by the latter when it recedes. The minimum is recorded by means of an alcohol thermometer containing a minute dumbbell-shaped marker of glass, which fits the tube loosely, so that when the thermometer rises the liquid flows past. Upon the return the surface film catches the marker, which is thus compelled to follow the receding column to its lowest point.

Where it is desired to indicate temperatures in such a way that the scale may be easily read from a distance, distortion thermometers are used. They are analogous to the aneroid barometer in principle, the same multiplying devices being used to carry a hand along a circular scale. Fig. 4 shows a familiar form. It consists of a strip of copper and one of steel fastened side by side and bent so as to form nearly a complete ring. The copper is on the inside. Difference in the expansion of the two metals distorts the double piece which is fastened at one end, and the slight movement of the free end is magnified by the simple device shown in the figure. The spiral spring secures a prompt return of the pointer. In Great Britain and the U. S. the Fahrenheit scale is used. It makes freezing point at 32°, and boiling point at 212°. The centigrade scale of Celsius divides this interval into 100°, while the little-used Réaumur scale divides it into 80 parts. The ratio of the three is therefore: 1° F. = $\frac{5}{9}$° C. = $\frac{4}{9}$° R.

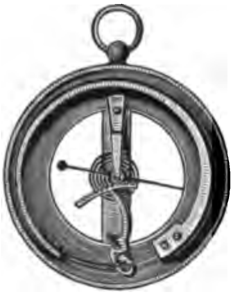


Fig. 4.

Thermop'ylæ, or simply **Py'læ,** a narrow defile between Mount Œta and the Maliac Gulf, leading from Thessaly into Locris. It was the only way by which an enemy could enter from N. Greece into Hellas, and became celebrated as the scene of the heroic death of Leonidas and his 300 Spartans in their attempt to prevent the Persian hordes from passing through the defile. The locality is no longer a pass, as it has been widened by natural causes into a swampy plain.

The'seus, in Grecian mythology, the national hero of Attica and the founder of Athens; a son of Ægeus and Æthra. He was married first to Antiope, the queen of the Amazons, and afterwards to Phædra. He took part in the campaign of the Argonauts, in the Calydonian hunt, in the battle with the Centaurs, etc., but his most famous exploit was the slaying of the Minotaur. Attica was bound to send annually a tribute of seven maidens and seven youths to Crete to be sacrificed to this monster. In order to put an end to this misery, Theseus repaired to Crete and won the affection of Ariadne, the daughter of King Minos, who provided him with a clue to the labyrinth and a sword to kill Minotaur; he slew the monster and carried off Ariadne, whom he afterwards left on Naxos. During a revolution in Athens he fled to Scyros, where he perished by the treachery of King Lycomedes, but in 469 B.C. Cimon conquered Scyros and brought his bones back to Athens, where they were interred in the celebrated temple of Theseus (the Theseum). By the sculptors Theseus was sometimes represented as resembling Hercules, with a lion's skin and a club, though of a lighter and fleeter form and of a more elevated expression; sometimes as resembling Hermes, with chlamys (a short cloak) and petasos (a cap).

Thessalo'nians, Epis'tles to the, two New Testament epistles written by St. Paul to the church at Thessalonica, in all probability during his long stay at Corinth, and therefore not very long after the foundation of the Thessalonian church, on St. Paul's second missionary journey. A note at the end of each of the epistles in our Authorized Version states that they were written from Athens, but there can be little doubt that this is erroneous, and that they were really written at Corinth. They are the earliest of Paul's writings, and are characterized by great simplicity of style as compared with his other epistles. The genuineness of the first epistle has hardly ever been questioned, but, according to the newer criticism, that of the second epistle is more than doubtful.

Thessaloni'ca. See SALONICA.

Thes'saly, or **Thessa'lia,** a large division of ancient Greece, bounded E. by the Ægean Sea, N. by Macedonia, and W. by Epirus. The surface is a fertile plain, and the land was in ancient times famous for its wheat and its fine breed of horses. The inhabitants were Æolians, but very early the Epirotes invaded and conquered the country, and made the inhabitants their slaves. The government was oligarchical, but very often disturbed by internal wars, which was the reason that Thessalia never exercised any influence on the affairs of Greece. It was conquered by Philip of Macedon, and passed from Macedonia into the hands of the Romans. After long subjection to Turkey, Thessaly was added to Greece in 1881 through the recommendation of the powers after the Russo-Turkish War; total area, 5,073 sq. m.

The'tis, in Greek mythology, the leader of the Nereides, wife of Peleus and mother of Achilles.

Thibet'. See TIBET.

Thierry (tē-ā-rē'), **Jacques Nicolas Augustin,** 1795-1856; French historian; best known by his "Histoire de la Conquête de l'Angleterre par les Normands." He lost his sight in 1826, but continued his labors by the help of his wife and friends.

Thiers (tē-ėr'), **Louis Adolphe,** 1797-1877; French statesman and author; b. Marseilles; studied law at Aix; was admitted to the bar in 1818, and began to practice, but was drawn to politics and literature, and removed in 1821 to

Paris. His articles in the *Constitutionnel* attracted wide attention. In 1823 he began to publish his "Histoire de la Révolution française," which made his name popular throughout France. In 1830 he founded the *National*, and took an active part in the revolution which effected the change of dynasty in France. He was elected a member of the Chamber of Deputies, held office in the Ministry of Finance, and in 1832 became Minister of the Interior. For the next four years he directed the policy of the cabinet, though he was not Prime Minister till 1836. In the controversy between Mehemet Ali and the Porte, France supported the former, in the hope of gaining the supremacy in Egypt and Syria, while Russia, Great Britain, Austria, and Prussia insisted upon the integrity of the Ottoman Empire. Thiers assumed a menacing attitude, but the king refused to countenance extreme measures, and Thiers resigned. He visited England, Spain, Italy, and Germany, making preparations for his great work "Histoire du Consulat et de l'Empire."

On December 2, 1851, he was arrested and banished for opposition to the empire. He returned, but lived in retirement until 1863, when he was elected a member of the Representative Assembly by Paris. He was almost the only member of the Assembly who opposed and condemned the declaration of war against Prussia, but after the downfall of the empire he developed an astonishing energy to save his country from utter ruin. September 17, 1870, he started on a tour to London, St. Petersburg, Vienna, and Florence to procure foreign intervention, and in October opened negotiations with Bismarck concerning an armistice. After the capitulation of Paris and the conclusion of the armistice he was elected a member of the National Assembly by twenty-six departments, and the Assembly chose him chief of the executive. On August 31st his term of office was fixed at three years, and he received the title of "President of the Republic." He was very successful in negotiating the peace; he saved Belfort and one milliard for France. He was still more successful in procuring the means of fulfilling the conditions of peace. The insurrection of the Commune was promptly put down, but his attempt at consolidating the "conservative republic" by legislative enactment failed, and on May 24, 1873, he resigned. He continued a member of the Assembly, and in 1876 was elected senator for Belfort.

Third Estate′. See Estates, The Three.

Third Or′ders. See Tertiaries.

Thirst, a sensation normally caused by the need of water in the animal system, and consequently relieved by drinking. The great thirst of cholera is also caused by a deficiency of water. But thirst also accompanies febrile excitement. This is only temporarily relieved by drinking, and unless contraindicated by the symptoms small lumps of ice will usually relieve the thirst and reduce the excessive heat. The use of too much salt is another familiar cause, the explanation being in this case the excessive salinity of the blood.

Thir′ty-nine Ar′ticles of Reli′gion, doctrinal formulas of the Reformation period. When the Reformation was fairly introduced into England under Edward VI (1547–53) Archbishop Cranmer at first entertained the project of framing an evangelical catholic creed in which all the reformed churches could agree in opposition to the Church of Rome, then holding the Council of Trent, and invited the surviving continental reformers — Melanchthon, Calvin, and Bullinger—to London for the purpose. Failing in this scheme, he framed, with the aid of his fellow reformers—Ridley and Latimer, the royal chaplains, and the foreign divines, Bucer, Peter Martyr, and John à Lesco—the "Forty-two Articles of Religion" for the English Reformed Church. They were completed in November, 1552, and published in June, 1553, by royal authority. The reëstablishment of the Papacy under Mary (1553–58) set them aside, together with the Edwardian Book of Common Prayer. Under Elizabeth (1558–1603) the articles were revised and permanently restored. They were reduced to thirty-nine and brought into the shape they have ever since retained.

The Thirty-nine Articles covered nearly all the heads of the Christian faith, especially those which at the time of their framing were under dispute with the Roman Catholics. They affirm the old orthodox doctrines of the Trinity and incarnation, the Augustinian views on free will, total depravity, divine grace, faith, good works, election, and the Protestant doctrines on the Church, purgatory, and the sacraments of baptism and the Lord's Supper. They are borrowed in part from Lutheran standards—namely, the Augsburg Confession of Melanchthon (1530) and the Würtemberg Confession of Brentius (1552), but on the sacraments, especially the much-disputed doctrine of the real presence in the eucharist, they follow the Swiss reformers, Bullinger and Calvin. In the political sections they are purely English, and teach the Erastian doctrine of the spiritual as well as temporal supremacy of the sovereign as the supreme governor of the Church of England. The Protestant Episcopal Church in the U. S., after effecting an independent organization in consequence of the American Revolution, adopted the Thirty-nine Articles of the mother church at the General Convention held in Trenton, N. J., September 12, 1801, but with alterations and omissions in the political articles, which the separation of Church and State made necessary. The only doctrinal difference is the omission of all allusion to the Athanasian Creed, which is also excluded from the American Prayer Book. The Twenty-five Articles of the Methodist Episcopal Church and the Thirty-five of the Reformed Episcopal Church are based upon the Thirty-nine Articles. See Faith, Articles of; Creed.

Thirty Ty′rants, a body of thirty magistrates in Athens (404–403 B.C.). They were appointed from the aristocratic party by the Spartans, victorious in the Peloponnesian War. The tyrants were guilty of the most cruel and shameless acts, and after one year were expelled by Thrasybulus.

Thirty Years' War, a succession of wars (1618–48) begun as a struggle between Roman

Catholics and Protestants, carried on to establish the authority of the German emperor over the religious interests of Germany, and concluded as a struggle of the house of Austria to maintain its imperial power.

Causes of the War.—By the Treaty of Augsburg (1555), each of the German states was permitted to determine the nature of its national religion. All subjects were permitted to remove from states in which their religion was forbidden to states in which it was officially sanctioned. But Protestantism continued in Catholic states and Catholicity continued where it was prohibited. Protestantism throve, especially in Bohemia and Austria; but under Rudolf II (1576–1612) a reaction, largely under the influence of the Jesuits, set in. In 1608 the Evangelical Union and in 1609 the Catholic League were formed to protect their respective interests. The Emperor Matthias (1612–19) gave certain guaranties of liberty, but in 1617 Ferdinand of Styria, a pupil of the Jesuits, was crowned King of Bohemia. Persecutions began. Protestant churches were closed in Braunau and pulled down in Klostergrab. The Protestant estates met in Prague, March 5, 1618, and petitioned the Emperor Matthias, who declared their meeting illegal. Protestants and Catholics alike in all parts of S. Germany took up arms.

The Bohemian War (1618–20).—The concessions made to Protestants in Bohemia were withdrawn, and an insurrection followed. Frederick V, the Elector Palatine and a Protestant, was chosen King of Bohemia in 1619. Count Thurn repeatedly defeated the Catholic forces, but Frederick V was a courtier rather than a soldier, and his motley army was totally routed by the army of Maximilian of Bavaria at Weissemberg, November 8, 1620. The same autumn and winter the lower Palatinate was ravaged by an army of Spaniards under Spinola. The Protestants, utterly defeated in Bohemia, were given over to persecution.

War in the Palatinate (1621–23).—Count Mansfeld and Duke Christian of Brunswick at the head of the Protestant forces showed skill and energy in opposing the Catholic armies on the Rhine. They ravaged the territories of the Catholic League, and everywhere retaliated for the tyranny shown by Ferdinand II against the Protestants. Both sides fought with desperation. The imperial commander, Tilly, defeated the Margrave of Baden at Wimpfen (May 6, 1622); also Christian of Brunswick at Höchst (June 30, 1622) and at Stadtlohn (August 6, 1623). These victories might have ended the war but for two reasons. The Protestant princes in the N. were beginning to be aroused, and Mansfeld and Christian, though dismissed by Frederick (July, 1623), refused to lay down their arms or leave the field. They fought desperately on their own account in Alsace, in Lorraine, in Holland, and in Saxony, supporting their armies as they went, and everywhere leaving desolation.

The Danish-Saxon War (1624–29).—The Danish king, Christian IV, resented injuries inflicted on him by the emperor, and, supported by a British subsidy, joined the Protestant cause in 1624. With the forces of Mansfeld and Christian of Brunswick, he marched into lower Saxony. Meantime the Emperor Ferdinand had called for the help of Wallenstein, who, with the army of Leaguers under Tilly, now marched to the N. The Danes were routed in 1626 by Tilly at Lutter and Mansfeld by Wallenstein at Dessau. The hopes of the Protestants would have perished but for the fact that Mansfeld, after an apparently overwhelming defeat, gathered together forces enough to conduct a victorious raid through Silesia, Moravia, and Hungary. Meanwhile, however, the forces of Wallenstein and Tilly overran N. Germany and Denmark, and compelled Christian IV to sign a treaty of peace at Lubeck, May 12, 1629.

The Swedish-German War (1630–36).—In 1629 Ferdinand issued the Edict of Restitution, according to which all estates that had been secularized since 1552 were restored to the Catholic Church. The edict, unpopular with many Catholics, gave offense to the Protestants. Not content with this, Ferdinand fomented a revolt of the Poles against Sweden, thus intensifying the indignation that was already at the point of war. On July 4, 1630, Gustavus Adolphus landed with a Swedish army at Usedom, drove the imperialists out of Mecklenburg and Pomerania, and formed alliances with Hesse, Saxe-Weimar, Magdeburg, Brandenburg, and Saxony. Tilly advanced against the new alliance, and stormed and sacked Magdeburg, May 20, 1631, after a desperate siege. The city was given up to plunder, and the slaughter of the inhabitants became memorable. But at Breitenfeld, near Leipzig, Tilly was nearly annihilated. Gustavus advanced to the W., to the S., and to the E., traversing the Rhine and ascending the valley of the Main, defeating his enemy on the Lech, April 15, 1632, where Tilly was slain, and entering Munich, May 17th, after having established organizers and supporters in every important city along his route. The brilliancy of this march startled Europe and laid the basis for a new Evangelical Union, with Sweden at the head. Ferdinand saw that the case was desperate, and thereupon recalled Wallenstein, whom he had previously disgraced, giving him practically unreserved powers. Wallenstein rapidly collected an army, overran Bohemia, and marched N. into Saxony. Gustavus was obliged to follow. In the desperate battle of Lützen (November 16, 1632) Wallenstein was defeated, but the cause of the Protestants, while overthrowing the enemy, suffered an irreparable loss in the death of Gustavus Adolphus at the moment of victory. The Swedes, under Oxenstierna, preserved their advantages until at Nördlingen, September 6, 1634, the Protestants, under Bernard of Weimar, were totally defeated. The cause of the emperor was thus reinstated, and Saxony signed a treaty of peace at Prague, May 30, 1635.

The French-Swedish War (1636–48).—Richelieu, having broken the political power of the Huguenots and of the nobles in France, was now ready to advance to the third great object of his policy—the defeat of the ambitions of Austria. To secure the hearty alliance of France, Oxenstierna yielded to Richelieu the direction of the war. The contest then became political rather than religious. While France united with Sweden, Denmark and Saxony united with the Emperor Ferdinand. Another set of generals then came into prominence. The Swedes under Banér held N. Germany, and, after penetrating Silesia and Bohemia, defeated the Austrians and Saxons at Wittstock in 1636. The same army under Torstensson and Königsmark gained further victories at Breitenfeld (1642) and Jankau (1645). Meantime, Turenne and Condé devastated the regions of the Rhine, and drove the imperial forces from the Palatinate and from Bavaria. These successes prepared the way for an invasion of Austria, which was about to take place when the terrible struggle was brought to an end by the Peace of Westphalia, October 24, 1648. As the fruit of this most terrible of modern wars, Protestantism was saved, but at a cost which it is difficult even to estimate. The population was greatly decreased; intellectually and morally the people suffered a great decline. Germany was disintegrated, and the material losses were such that a complete recovery had hardly taken place at the end of two centuries.

Thisbe. See Pyramus and Thisbe.

This'tle, any one of many stout spinous herbs of the *Compositæ* and of the genera, *Cnicus, Carduus, Centaurea, Onopordon.* A few have medicinal qualities, and some have fine flowers. The roots and leaves of some species were once eaten as food. The creeping thistle, erroneously called the Canada thistle (*Cnicus—or Carduus—arvensis*), is a noxious weed of European origin, now naturalized in America. It is a perennial, with many long, running underground stems which come to the surface and give rise to new plants. When these creeping stems are cut or broken, each part produces a new plant.

Creeping Thistle.

Thistle, Or'der of the (also called the Order of St. Andrew), a Scottish order of knighthood, reputed on insufficient grounds to be of great antiquity. The thistle is mentioned as the national emblem of Scotland in the inventory of the effects of James III, who is thought to have adopted it. But the order had no distinct existence previous to 1687, when a warrant for its restitution was issued by James VII of Scotland and II of England. It fell into abeyance after the abdication of James, but was restored by Anne in 1703, and is now one of the recognized orders of the British Empire. The number of knights, originally twelve besides the sovereign, is now sixteen. The star of the order is of silver, with eight rays, and a thistle in the center, surrounded by the motto, "Nemo me impune lacessit" (No one injures me with impunity).

Thom'as, or Did'ymus, Saint, one of the twelve apostles, of whose personal character and history nothing is known except by two or three allusions in the Gospel of John. The most important of these is his refusal to believe in the resurrection of Jesus until convinced by tangible proof. Two apocryphal works are ascribed to him—a "Gospel" and "Acts." He was represented by later so-called "tradition" as having preached in Ethiopia, Egypt, Parthia, or India, and in the latter country the Christians of St. Thomas, found by the Portuguese on the Malabar coast in the sixteenth century, claimed to originate from his preaching. This, however, is probably due to a confusion with a Nestorian or Manichæan missionary. Great efforts have been made by several Spanish, Mexican, and S. American theologians to make it appear that the apostle evangelized America, and traces of his presence are pointed out in sacred caves and other sites from Paraguay to Mexico, in which latter country he has been formally identified by several native antiquarians with the Aztec divinity, Quetzalcohuatl.

Thomas, George Henry, 1816–70; American military officer; b. Southampton Co., Va.; graduated at the U. S. Military Academy, 1840; served in Florida against the Seminoles and in the Mexican War; was instructor at the Military Academy, 1851–54, and in 1855 was appointed major of the Second Cavalry, with which he served for the next five years. On the outbreak of the Civil War, Thomas at once gave his adherence to the Union. Promoted to brigadier general of volunteers in August, 1861, and transferred to the Department of the Cumberland, he was for a time engaged in organizing the First Brigade; was given command of the First Division (Army of the Ohio) in November, 1861, and fought in the battle of Mill Springs (January 19–20, 1862), which was the most important victory yet gained in the W., and brought Thomas into notice. He was promoted to major general of volunteers, April 2, 1862, and rendered valuable service in the W. and S. In the battle of Murfreesboro he commanded the center, and at Chickamauga, September 19–20, 1863, he commanded the left wing, where the great struggle took place for the repossession of Chattanooga, out of which the enemy had been maneuvered. Thomas's wonderful resistance for upward of five hours against the efforts of the enemy after the Federal right was routed forms one of the most remarkable events in the war, and earned for him the name of "the Rock of Chickamauga."

He was given command of the Army of the Cumberland, and on October 27th commissioned brigadier general in the regular army. On September 27, 1864, Thomas was placed in chief command in Tennessee, with large discretionary powers, as it was a matter of doubt what were the intentions of Gen. Hood, who was moving northward in the hope of causing Sherman's withdrawal from Georgia. Thomas checked Hood's advance at Nashville, pursued him beyond the Tennessee, and destroyed his army. The appointment of major general in the regular army was (December 15, 1864) bestowed upon him, and Congress tendered him a vote of thanks. He contributed materially to the overthrow of the Confederacy by organizing raiding expeditions (resulting in the capture of Jefferson Davis in May, 1865).

Thomas, Theodore, 1835–1905; American orchestral conductor; b. Esens, Hanover; made début as violinist at the age of six; removed with his parents to New York in 1845. In 1855 he started a series of chamber-music concerts with William Mason, George Matzka, Joseph Mosenthal, Ferd. Bergner, and Carl Bergmann, which continued till 1869. In 1864 he began his first series of symphony concerts with an orchestra which he conducted until 1888. From 1878–81 he was director of the Cincinnati College of Music. For ten years he was conductor of the New York Philharmonic Society and of the Brooklyn Philharmonic Society, till, in 1892, he was appointed musical director of the World's Columbian Exposition in Chicago, in which city he remained leader of a permanent orchestra until his death.

Thomas à Becket. See BECKET, THOMAS À.

Thomas à Kem'pis. See KEMPIS, THOMAS À.

Thomas Aqui'nas. See AQUINAS, ST. THOMAS.

Thomas of Lon'don, same as THOMAS À BECKET. See BECKET, THOMAS À.

Thomas the Rhy'mer. See RHYMER, THOMAS THE.

Thom'son, James, 1700–48; English poet; b. Ednam, Roxburghshire; studied at the Univ. of Edinburgh, with the design of entering the Church, but, abandoning this intention, went to London in 1724, where he was tutor in a nobleman's family. In 1726 appeared his poem, "Winter," which became popular; "Summer" followed in 1727, "Spring" in 1728, and "Autumn" in 1730, completing "The Seasons." He published a "Poem Sacred to the Memory of Sir Isaac Newton" (1727), and "Sophonisba," a tragedy, acted in 1729. He then traveled for two years as tutor to the son of Lord Chancellor Talbot, by whom he was rewarded with the post of secretary of briefs, and wrote a poem on "Liberty" which met with unfavorable reception. The Lord Chancellor dying in 1737, the secretaryship was lost by Thomson, but he received a pension of £100, and later was rendered independent by the appointment of surveyor general of the Leeward Islands, which, after paying the deputy who performed all the duties, brought him £300 a year. His works, besides those already mentioned, are "Agamemnon," a tragedy; "Edward and Eleanora," a drama; "Alfred," a masque, which contains the song, "Rule Britannia"; "Tancred and Sigismunda," a successful tragedy; "The Castle of Indolence," a poem in the Spenserian stanza, which is his best work; and "Coriolanus," a tragedy, not produced until after his death.

Thomson, James ("B. V."), 1834–82; English poet; b. Port Glasgow, Scotland; successively army schoolmaster, journalist, and special correspondent. He is best known by his poem, "The City of Dreadful Night."

Thomson, Sir William (LORD KELVIN), 1824–1907; English physicist; b. Belfast, Ireland; educated at the universities of Glasgow and Cambridge. At the age of twenty-two he was appointed Prof. of Natural Philosophy in the Univ. of Glasgow, and held the chair for over fifty years. He published papers touching nearly every important theme with which the physicist has to deal. In 1867, in collaboration with Prof. Tait of Edinburgh, he issued "A Treatise on Natural Philosophy," in which the effort was made to base a complete and exhaustive theoretical analysis upon the doctrine of energy. From 1846–53 Thomson was editor of the *Cambridge and Dublin Mathematical Journal.* He was president of the British Association for the Advancement of Science (1871), of the Royal Society (1891), etc.

Aside from his labors in pure science, he was active as an engineer and inventor. It was in great part due to his skill in solving the many intricate problems involved in submarine telegraphy that transoceanic signaling became a practical success; and it was in recognition of that fact that he was knighted in 1866. Of his numerous inventions, many of which were made to meet the demands of the manufacture and operation of submarine cables, the best known are his quadrant and portable electrometers, compensated compasses for iron ships, various types of mirror galvanometers, the siphon recorder, a machine for the analysis of tidal curves, and a large number of commercial instruments for the measurement of electrical currents and potential differences. His services as savant and engineer received high official recognition by his elevation to the peerage in 1892 with the title of Lord Kelvin.

Thor, in Scandinavian mythology, the son of Odin and Jord. He ranked next to Odin, but was far more popular. He was the protector of Midgard and of human industries against nature's destructive forces, personified by the giants, with whom he was in constant conflict. Thunder and lightning were caused by his riding in the clouds in his car drawn by two goats. Just as the Christians put a cross on gravestones, so the Scandinavian heathens put the sign of Thor's hammer (a cross) on their rune stones. Thursday is named after Thor.

Thorac'ic Duct, the principal lymphatic vessel in the human body. It runs upward on the left side of the spinal column from the receptaculum chyli, and terminates near the junction of the left internal jugular and the left subclavian veins. It discharges into the blood current the chyle and most of the lymph of the body. Birds have two thoracic ducts—one on each side. Its outlet is provided with valves which prevent the ingress of blood, and the duct has other valves which allow the contents to pass upward, but not downward.

Tho'rax. See Chest.

Thoreau (thō'rō), **Henry David,** 1817-62; American author; b. Concord, Mass. He graduated at Harvard, 1837, and became a land surveyor, but occupied himself chiefly with pedestrian excursions and literature. In 1845 he built a small frame house on the shore of Walden Pond, Concord, where he lived alone for two years, working and studying, and thereafter worked at pencil making, an art he had learned from his father. His works are: "A Week on the Concord and Merrimack Rivers"; "Walden, or Life in the Woods"; "Excursions in Field and Forest," with a biographical sketch by R. W. Emerson; "The Maine Woods," "Cape Cod," "Letters to Various Persons," with nine poems; and "A Yankee in Canada," with antislavery and reform papers.

Although often stated, it is not true that Thoreau never voted or attended church, paid no taxes, and never used a gun. He lived simply, but seldom alone, always supported himself by the work of his hands or otherwise, was a good land surveyor, naturalist, and mechanic, a good citizen, a valued friend, and devoted to the comfort of his family. He never married, partly from an early disappointment in love, but was intimate with admirable women and the children of his friends, and was beloved by them, as by most of those who really knew him. He was original and sometimes eccentric, but never misanthropic or morose. His intellectual and moral elevation is plainly seen in his writings, which have steadily gained in favor since his death.

Tho'rium, also **Thori'num,** one of the rare metals, discovered by Berzelius in 1828 in a Norwegian mineral which he called thorite, from the Scandinavian god Thor. Thorium is a gray metallic powder, which burns with great brilliancy to snow-white infusible thoria, ThO_2.

Thorn Ap'ple. See Datura.

Thor'ough-bass, in music, the art of expressing chords by figures placed over or under a given bass. These figures indicate the harmony through all the other parts; hence the name. The term is sometimes taken in a larger sense, as equivalent to musical science.

Thor'oughwort. See Eupatorium.

Thorwaldsen (tŏr'wăld-sĕn), **Albert** (Bertel), 1770-1844; Danish sculptor; b. at sea. Bertel's schooling was short and unprofitable until he was sent to the free school of the Academy of Arts at Copenhagen. There, at seventeen, a bas-relief of Cupid reposing gained the silver medal; at twenty a sketch of "Heliodorus Driven from the Temple" gained the small gold medal; two years later he obtained the grand prize, which entitled him to receive the royal pension. In March, 1797, he arrived in Rome. His model of "Jason," which Canova praised, attracted an English connoisseur, Sir Thomas Hope, who gave the artist a commission to execute it in marble. The "Adonis," begun in 1808, was not finished until 1832. It is the only one of Thorwaldsen's statues which was entirely carved by his own hands. It is a triumphant answer to the charge brought against Thorwaldsen in his lifetime that he could not work in marble. "Not work in marble!" he said. "Tie my hands behind my back, and I will hew out a statue with my teeth!"

The bas-relief "The Triumphal Entry of Alexander into Babylon" celebrated Napoleon's entry into Rome in 1812. The familiar bas-reliefs "Night" and "Morning" were modeled in 1815. The "Venus Victrix" and the "Mercury" are, with the "Adonis" just mentioned, his most perfect works. The well-known groups of "Christ and the Twelve Apostles" and "John the Baptist Preaching" were completed in 1838 for the Church of Notre Dame at Copenhagen. In 1841 he went back to Italy, stayed a year, then returned to Copenhagen, where he died suddenly. The chief part of his fortune was left as a perpetual endowment for the museum at Copenhagen, which is raised around his grave, and contains only his works. Thorwaldsen's works are numerous—205 are known—and of them his colossal lion carved out of solid rock near Lucerne, commemorating the Swiss Guards who fell in the Tuileries in 1792, and his bas-reliefs of "Night" and "Morning," executed at a single sitting, are the best known. He is chief of those modern sculptors who have tried to follow a purely classical tradition.

Thoth (Egyptian, Tehuti, "the measurer"), an Egyptian lunar deity, god of wisdom, whom the Greeks identified with Hermes. He is represented as an ibis-headed man, and occasionally he is shown surmounted by a crescent

Thoth.

moon and the sun disk. He was regarded as the adviser and scribe of the gods, as the inventor of writing and of numbers, and as the measurer of time.

Thothmes (thŏth'mēs), Egyptian, TEHUTI-MES), name of four kings (fourth, fifth, sixth, and eighth) of the eighteenth Egyptian dynasty, of whom THOTHMES III is the most important. He was the greatest of Egyptian warriors. His efforts were directed toward the entire subjugation of W. Asia. He subdued Palestine, Syria, and a portion of Mesopotamia, together with the region between the Euphrates and the Mediterranean. He took Megiddo, Tyre, Kadesh on the Orontes, Carchemish, and a large number of other places, whose names he inscribed in the temple of Karnak. It is supposed that his dominion extended to the border of Asia Minor, and from Cyprus also he received tribute. At home he built on an extensive scale. Thebes naturally received most of his attention, and there he labored principally in extending the temple of Karnak, which he adorned with inscriptions that give a complete record of his reign. One of the obelisks he erected now stands in Central Park, New York. Evidence of an intense hatred of his early coregent, Hatasu, is seen in the fact that he industriously erased her name wherever it was possible. His reign covered about fifty-three years in all, of which for about thirty-one he was sole king. Using astronomical data, it has been calculated that his reign extended from March 20, 1503, till February 14, 1449 B.C.

Thought, the mental processes of comparing, judging, and reasoning. The term thought is used to mark off those mental states in which there is a breaking loose from particular objects and the manipulation of general notions, concepts, signs, or terms. It involves apperception, the relating function, primarily, but after it comes to work upon the more abstract material used in arguments, reasonings, inferrings, and the like. In its nature, however, thought cannot be held to differ from the lower exercises of mind seen in perception. The distinction is largely one of range and reach in the use of material. The lower animals seem to come only to a very small degree of thought.

In conception, the object which the mind is thinking about is a "general idea," concept, or notion. It is a mental state which is equivalent in thought to more than one object in the external world. When, for example, a man speaks of the "place of the horse in the animal kingdom," he is using a concept, "horse." The psychological point at issue is the way the mind comes to have a state which thus stands not for any particular object—no one single horse—but for any of the objects which go in a class, large or small. General ideas are generally distinguished as "abstract"—*i.e.*, when they designate a quality of objects, such as "green," "sweet," etc., independently of the kinds of objects to which this quality may apply; and concrete, or "general," in a narrow sense—*i.e.*, when they refer to the objects themselves, as to number, distribution, etc., independently of the qualities which they possess, as, for example, the case given, "horse." The way that the concept arises on the basis of the perception of the particular objects which come first in mental growth is called "abstraction" and "generalization" in these two cases, respectively.

Judgment is usually applied to the mental procedure of asserting anything, as "Socrates is mortal," "It rains." The theory of judgments when they are thrown into statements called "propositions" belongs to logic. The action of the mind in getting and using its judgments, however, belongs to psychology. The theory most current on the psychological side looks upon judgment as just the mind's own consciousness of the progress it is making with its conceptions. For example, the judgment "horses eat grass" is looked upon by the newer theory as the mind's expression to itself of the fact that the new quality or attribute of eating in a particular way has to be added, in future cases when horses are thought of, to the concept which stands for this class of animals. There seems to be nothing added to the concept by the mere fact of judgment—that is, nothing additional to what is already there in the altered concept.

It is the process of reasoning which is usually suggested by the word thought; and reasoning is, when psychologically considered, the most explicit form of the growth of conception, and with it of the direct assertion found in judgment. The detailed treatment of reasoning belongs to logic (*q.v.*). In every piece of reasoning, in every argument, what we really have is an attempt to broaden our conception of the subject reasoned about by adding to it certain new elements. We do this by discovering relations between concepts formerly held apart; and the successful union of such conceptions in one is what we call the "conclusion" of the argument. So here again the old psychology is wrong in thinking that reasoning is a distinct faculty. It is only the general apperceptive or synthetic function of consciousness, as it works on more general and detached elements of perception and conception. The reason, therefore, that animals do not show more reasoning power than they do is probably simply that they are not developed far enough, either in consciousness or in the brain complexity that accompanies consciousness to do much of the synthesis which thought embodies.

Thought Trans'ference and Thought Read'ing. See TELEPATHY.

Thou'sand and One Nights. See ARABIAN NIGHTS.

Thousand Is'lands, a group of about 1,800 islands situated in the St. Lawrence River, near the outlet of Lake Ontario; famed for the beauty of their scenery. Many have been chosen as sites for summer cottages. An expansion of the river, caused by the numerous islands obstructing it, is known as the Lake of the Thousand Islands. A belt of crystalline rock termed Laurentian gneiss, which unites the Adirondack hills of New York with a vastly larger area of a similar geological character in Canada, is crossed by the St. Lawrence, and, owing to the unevenness of the surface of the rock and inequalities in the depth of the glacial deposits spread over it, many islands were formed when the region became partially submerged.

Thrace, in earliest times the indefinite region of country N. of Mt. Olympus, but later on the boundaries were: On the N. the Danube, on the E. the Black Sea, on the S. the Hellespont and Thracian Sea, on the W. the Strymon. The Thracians belonged to the Indo-European family and in earliest times had attained a relatively high standard of culture, as is indicated by the religious myths that originated in or were connected with Thrace. Little is known concerning the history of the country. The people were warlike, living mainly by plunder and robbery, and were notorious for drunkenness. They were conquered by Philip and Alexander, and from the Macedonians the country passed to the Romans, though it was not fully subdued until 26 B.C.

Thrale, Hester Lynch Salusbury. See PIOZZI.

Thrash'er. See THRUSH.

Thrasybu'lus, Athenian general, attached to the democratic party; d. 390 B.C. At the battle of Cynossema (411) he secured the victory. In 407 he reduced most of the revolted cities on the coast of Thrace, and about the same time was with Alcibiades elected one of the new generals. Banished on the establishment of the thirty tyrants, he seized the fortress of Phyle, occupied Piræus, and finally delivered Athens and restored the democratic government (403). He was killed by the people of Aspendus, in Cilicia, who were exasperated by the acts of his soldiers.

Thread, a slender cord consisting of two or more yarns, or simple spun strands, firmly united together by twisting. The twisting together of the different strands or yarns to form a thread is effected by a thread frame or doubling and twisting machine, which accomplishes the purpose by the action of bobbins and flyers. Thread is used in some species of weaving, but its principal use is for sewing. In the U. S. there are large thread works in Willimantic, Conn., and in Newark, N. J. The chief seat of the cotton-thread manufacture in England is Manchester, in Ireland, Belfast, and in Scotland, Paisley.

Three Bod'ies, Prob'lem of, the problem of determining the motion of three mutually gravitating particles. The discovery of the law of universal gravitation by Newton reduced the question of the motion of the planets to one of almost pure mathematics. Newton himself was able to show that if two bodies like the sun and a planet attract each other with a force inversely as the square of their mutual distance, they will each describe a conic section around their common center of gravity. The planet being very small relatively to the sun, this common center of gravity would be very near the center of the sun, and the planet might, therefore, be said to describe a conic section around the sun. It was thus shown that, considering only the attraction of the sun upon the planets, each planet would revolve in an ellipse having the sun in one of its foci. But since each planet is attracted by all the other planets, as well as by the sun, this motion in an ellipse represents only an approximation to the real motion. Hence mathematicians were led to propound the more general problem: Three bodies being projected in space with any velocity and in any direction whatever, and then left to their mutual attraction, to find the motion of each of them during all time. The general and complete solution of this problem was found to be beyond the power of mathematical analysis, for the reason that the curves described by the several bodies would be so irregular, subject to such constant variation, and changing so greatly according to the masses of the bodies, that it would be impossible to express them by any mathematical formula. It was, however, possible to find certain general laws to which the motion would be subject. The center of gravity of the three bodies would always move in a straight line with a uniform velocity. Certain relations were found to subsist between the masses of the bodies, their distance apart, and their velocities, and certain great principles were established.

The efforts of mathematicians have generally been directed, not to the general problem, but to two special cases of it which occur in the solar system. The first is that of the motion of two planets around the sun, in which the masses of the bodies are very small compared with that of the sun, while their motion takes place in nearly circular orbits. The deviations of each planet from the average ellipse in which it would move if not attracted by the other then admit of being determined with any required degree of accuracy, though not with mathematical rigor. The actual problem of planetary motion is, however, not simply that of three bodies, or two planets, but of nine bodies, there being eight large planets. But the solution of the problem of any number of planets involves no greater mathematical difficulties than are encountered in the case of two, though the labor of the numerical solution is immensely greater. The other special case is that of the motion of the moon around the earth, under the influence of the attraction of the sun as well as of that of the earth. This is a more complicated case than that of planetary motion, because, while the moon revolves around the earth, both the earth and moon revolve together around the sun. But by the researches of Hansen and Delaunay this difficult problem of the moon's motion has been solved with nearly the same degree of accuracy as that of planetary motion.

Three-Col'or Print'ing, a process for the reproduction of colored pictures. The preliminary step in the process is the obtaining of three photographic negatives of the picture to be reproduced. Each of these negatives reproduces by a special process one of the following color values of the picture: yellow, blue, and red. These colors are chosen because their admixture in various proportions will reproduce all other colors, with little loss to their real values.

To aid in obtaining the negatives, colored screens or filters are used. In making the yellow negative, a color filter is used to shut out the yellow rays and allow only the red and blue rays to pass through. Thus the yellow values form the transparent part of the negative, just as black forms the transparent part of an ordinary photographic negative. Similarly, for the red negative the filter admits only the blue and yellow rays, and for the blue negative only the yellow and red rays.

Half-tone plates for printing are made from these negatives according to the ordinary process. The yellow plate is printed first, then the red over that, and finally the blue over all. As a result of the superposition of these colors in their varied proportions the picture is reproduced in its original color values.

Thresh'er. See Fox Shark.

Thresh'ing Machin'ery, machinery for the separation of grain from the straw. In N. America threshing machines were early invented, but it is only since about 1840 that this class of machinery has been brought to perfection. Among those earlier invented, the plan of rotary beaters or flails attached to a revolving shaft was the subject of much experiment. A revolving cylinder provided with radial teeth or spikes, and working with a concave section of a cylinder provided with similar but inwardly projecting teeth, comprised the beating mechanism which was first found uniformly successful. Changes and improvements have related for the most part to the mode of giving motion to this cylinder and to accessories for securing safety and convenience. Those which first came into common use had the cylinder moved by intermediate gearing from a vertical driving shaft, from the upper end of which extended radial arms, and which was moved by horse power. The sheaves, unbound, were fed with the heads first into the space between the cylinder and its concave. In some of the first of these machines shaking screens were so applied as to sift the grain and chaff, the straw being carried and deposited by itself, while the former passed to the hopper of a fanning mill, which cleaned or separated the grain from the chaff.

Many attempts were made to supersede this mode of driving the cylinder by an endless belt constructed with transverse wooden lags and driven after the manner of a treadwheel by horses. These finally culminated in the invention of the "railroad horse power."

The ordinary threshing machine in use in the E. states comprises either a portable steam engine or a railroad horse power for two or three horses, and a thresher composed essentially of the toothed cylinder acting in conjunction with the toothed concave. An endless shaker, formed with transverse wires and operated like an endless belt, conveys the straw some distance in the rear of the thresher, a vibrating motion given to the belt shaking out the chaff and grain, these latter being passed to a fanning mill, which separates the chaff, small seeds, etc., from the winnowed grain. During recent years much attention has been given to straw-burning furnaces for steam boilers of threshing machines in the open field. By these the straw is used in generating the power which drives the thresher. Straw-burning furnaces have been used in Hungary during a long period, and for many years the straw of the rice fields in the S. U. S. has been utilized in the same manner.

A Californian apparatus for cutting, threshing, and winnowing grain in the field is constructed as follows: A large grain frame is supported on two heavy driving wheels. Projecting from the side of this frame is a platform like that of an ordinary reaper, but about 12 ft. long. This runs at such height that the reciprocating sickle at the front will cut off the heads from the standing grain; the heads fall on an endless apron running longitudinally upon the platform and are carried by this to a hopper that conducts them to a threshing cylinder having a fanning mill and straw separator arranged behind it. The threshed and winnowed grain is thrown out from the fan mill through a spout at the side directly in the mouth of a sack suspended under the spout. An attendant riding upon the platform ties the sacks when full and throws them off upon the ground, to be collected at leisure. The driving parts receive their motion from the large or driving wheel by means of suitable bands and gearing. This apparatus was designed to be drawn by ten horses.

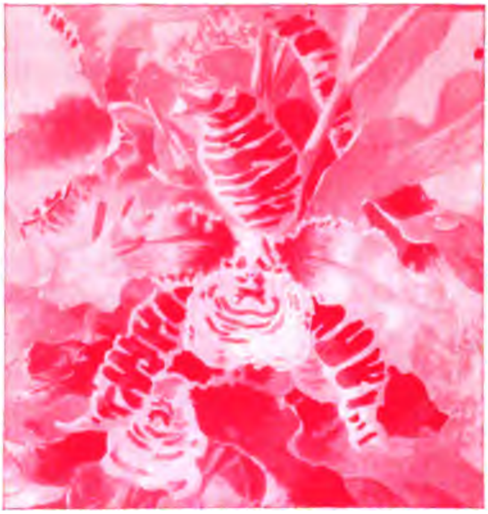
Thrips, minute insects about ⅛ in. long, belonging to the order *Physopoda*, of the class *Hexapoda*. They abound in daisy, clover, and other blossoms, and are named from the character of the tarsi, which are bladderlike at the tip and without claws. The two pairs of wings are long, narrow, membranous, not folded, fringed with long hairs, and laid horizontally along the back when at rest. The mouth parts, which are probably used chiefly in sucking, are intermediate in form between those of the sucking and those of the biting insects.

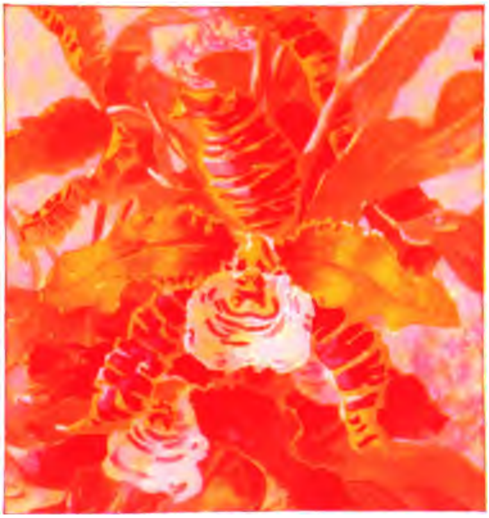
Throm'bus, a clot of blood within the blood vessels or heart. Inflammations of the lining membrane of the vessels, altered states of the blood, and slowing of the current of blood are the principal factors which contribute to the formation of clots. Their appearance varies according as they are formed rapidly or slowly. Thrombi in the vessels or heart tend to undergo softening or disintegration and particles may thus be swept to distant parts of the circulation. But under favorable conditions, and particularly in those in small vessels, thrombi become organized, and thus obliterate the blood vessel where they occur. This is the most important feature of thrombosis, for in this manner severed blood vessels are obstructed and hemorrhage permanently arrested.

Thrush, any one of various birds of the *Turdidæ*, a group of *Oscines*, which stands at, or near, the head of the class of birds, and includes many of the best songsters. They are birds of moderate size, well typified by the wood thrush (*T. mustelinus*) of the E. U. S., a delightful songster and a near relative of Wilson's thrush (*T. fuscescens*) and the gray-cheeked thrush (*T. aliciæ*). These birds re-

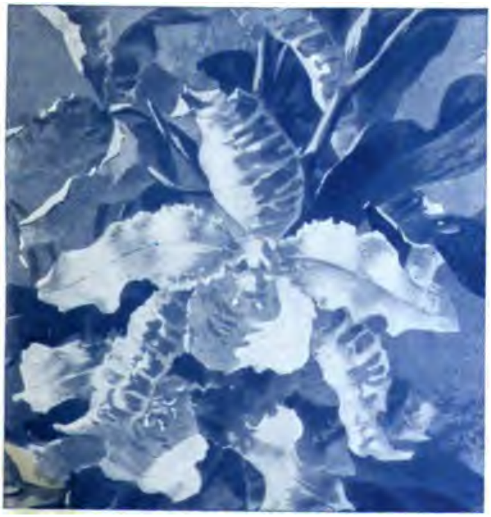
FIRST PRINTING, YELLOW

SECOND PRINTING, RED

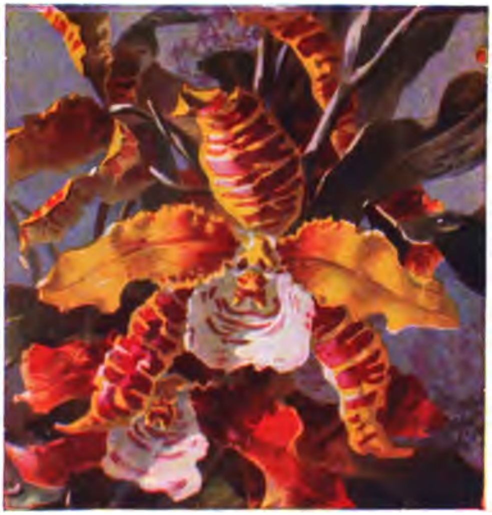




RED
AND
YELLOW
IMPRESSIONS



THIRD PRINTING, BLUE



RED, YELLOW, AND BLUE IMPRESSIONS

THREE-COLOR PRINTING.

semble one another closely, being more or less olive brown above and white below, with blackish spots. The European song thrush (*T. musicus*) is much like the wood thrush on a larger scale. The name thrasher is given to the American brown thrush and others of the species. The common robin (*Merula migratoria*) of the U. S. is a thrush, and so is its relative, the blackbird of Europe (*M. merula*). The golden-crowned thrush is known as the ovenbird.

Wood Thrush.

Thrush, a disease which occurs most frequently in infants, and in adults who have been reduced by previous illness. It is characterized by the appearance of membranous spots, white or grayish white, deposited within the membrane of the mouth, but always in its outer layer. These membranes are made up of the fungus and parts of the mucous membrane, especially epithelial cells; they are detached with some difficulty, and sometimes there is left a bleeding spot where they are detached. The disease has frequently been mistaken for diphtheria of the mouth, but careful examination makes this error impossible. As a rule, the disease is amenable to treatment.

Thucydides (thū-sĭd'ĭ-dēz), abt. 470–abt. 400 B.C.; Greek historian. He belonged to an old aristocratic Athenian family. He received an education that matched his lineage and his wealth. The story that he heard Herodotus read his history at Athens is destitute of warrant, but not destitute of probability. At the outbreak of the Peloponnesian War Thucydides had reached what he calls the age of discernment, and in 423 commanded a detachment of Athenian forces, which was to operate on the Thracian coast. Having failed to relieve Amphipolis, he was condemned to death for high treason, and forced to withdraw from Athenian territory; nor did he receive formal permission to return until the end of twenty years. The time and manner of his death are alike uncertain. One account has it that he was assassinated.

The history of Thucydides, which covers twenty-one years of the Peloponnesian War, has come down to us in eight books, of which the eighth has not received the last hand of the author. Thucydides is universally considered the first and greatest critical historian of antiquity, and claims for himself the credit of an exactness which is possible only to conscientious research as distinguished from hearsay report. His theme, as announced in the outset, is the war and its causes. His narrative is rigidly annalistic, year by year, summer by summer, winter by winter, to the detriment of effective grouping, and to the disgust of the rhetorical historians of a later day.

Thucydides was a man of affairs and a soldier and knew the springs of action even if he could not always work them. His vision was clear of superstitious glamour, his deity was "the strong god, the chance central of circumstance." His portraits of character abide not merely because of his artistic power, but because of their truth to life. His exhibit of the political forces at work commends itself the more because of the impartiality of the form. He does not tell us what was thought; he bids us listen to the voices of the time, and the statesmen and the captains of the period are made to give abundant expression to the motives of the war. No less than one fifth of the history is taken up with the speeches in which the thought of the time is dramatized. His narrative shows great variety, sometimes breathlessly rapid, sometimes lingering on picturesque detail. The story of the Sicilian expedition is the most elaborate specimen of his art, the retreat of the Athenians from before Syracuse one of the most famous descriptions in all literature. His style is confessedly a hard style, and not undesignedly so.

Thugs, members of a religious fraternity of robbers and murderers which flourished in India from the fourteenth till the nineteenth century. They were worshipers of Kali, by whom they believed themselves to be commanded to murder and rob. Therefore they were utterly unconscious of wrongdoing, considering themselves priests of the goddess carrying out a pious work, for which they were rewarded with the booty gained on their expeditions. They never committed a murder without solemn preparatory rites, prominent among which were the sacrifice of sugar and the consecration of the pickax, symbolizing the tooth of Kali. In 1826 they were utterly stamped out by the English.

In the U. S. the name is applied to those who rob with violence.

Thule (thū'lē), the name which Pytheas (at the time of Alexander the Great) gave to a land which he discovered after sailing six days in a northerly direction from the Orkney Islands. Later, the Romans used the name as a general signification for the northernmost parts of the habitable earth—*ultima Thule.* What island Pytheas meant is unknown.

Thumb'screw, an instrument of torture applied to and compressing the thumbs. It was used by the Spanish Inquisition and in Scotland.

Thummim. See URIM AND THUMMIM.

Thun'der, a rumbling or crashing noise heard after vivid flashes of lightning. Intense electrical discharges in the atmosphere, whether from cloud to cloud, from cloud to earth, or from cloud to cloud and then to earth, are followed by the sound which, on a small scale, is represented by the crackle of an artificial electric discharge. The origin of the sound is in the violent sudden increase in volume of the air along the path of discharge. The exceedingly high temperature, sufficient to make the air column incandescent, causes tremendously rapid expansion and motion of the air. Calculations have been made showing that if a cannon ball could have imparted to it a velocity of 100,000 meters per second we should hear something like the rumble of thunder instead of a whistling noise. Inasmuch as lightning flashes are of variable dimensions, and as cloud masses are also variable, and the air itself is of different density and purity at different times, all manner of sounds are produced, from the sharp crash to the prolonged rumble. The beginning of the thunder may be ordinarily taken to determine the nearest point of "break down" (or lightning) in the air and the duration of the thunder the length of the flash. Thunder may be heard from a great distance, but not so far as some artificial noises have been heard. J. J. Symons has run to earth a number of so-called thunder bolts, and concludes that the belief in the fall of material substances during thunder storms is merely the survival of the belief in mythical bolts of irate Jupiter. Belemnites frequently preserved as thunder bolts are really fossils. Sometimes aërolites and meteorites fall during thunder showers, but there is no necessary relation between them. Fulgurites or lightning tubes are found where heavy lightning penetrates into a bed of sand containing silex. The sand for a depth of several feet is fused into a glassy tube. Many of these have been dug out in good preservation, and good specimens are to be seen in museums.

Thurn und Taxis (tôrn ônt tăks'ĭs), a noble family of the German Empire, famous for its former possession of a monopoly of the postal service.

Thurs'day, the fifth day of the week. The later Roman pagans adopted the week of seven days, and named the fifth day Jovis dies, Jove's day; the name Thursday originated as a translation of this.

Thy'ine Wood, a wood mentioned in the Bible; probably the arar or sandarach wood, a large tree of Barbary which affords the resin called gum sandarach; its timber is considered imperishable by the Turks, who floor their mosques with it.

Thylacine. See TASMANIAN WOLF.

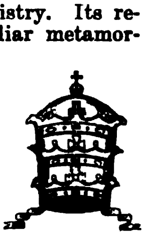
Thyme (tīm), any one of certain half-shrubby plants of the genus *Thymus*. None is indigenous to America. Two kinds are cultivated, the common, *T. vulgaris*, and the lemon scented, a variety of *T. serpyllum*, or wild thyme. The leaves are used for flavoring; the volatile oil is sold for oil of origanum, which it closely resembles.

WILD THYME.

Thy'mus Gland (so called from its resemblance to a bunch of thyme), a ductless gland, located in the neck below the thyroid gland, and in the chest beneath the sternum. It develops at the third month of fetal life, weighs ½ oz. at birth, and grows until the second year, attaining a length of 2 in. Thereafter it atrophies, and at the fourteenth or sixteenth year is obliterated, or its site marked only by a few fibers and a small deposition of fat. It has abundant blood vessels, nerves, and lymphatics, but research has failed to disclose positively its use, though it is suggested that the gland is connected with manufacture of blood in fetal life. The thymus of calves and lambs is called sweetbread, or neck sweetbread.

Thy'roid Gland, a glandular structure consisting of two lobes, with a connecting band, situated on the front of the neck and attached to the sides of the larynx. The gland moves with the larynx in respiration and deglutition. The thyroid gland is ductless, and its functions are obscure. Very probably it aids in the manufacture of blood in fetal life, and after birth it would seem to have certain functions connected with the animal chemistry. Its removal or disease occasions peculiar metamorphosis of the subcutaneous tissues, known as myxœdema. The thyroid gland is the seat of goiter.

Tia'ra, the papal crown, consisting of a cap of cloth of gold, encircled by three golden coronets, and surmounted by a mound and cross of gold. It is considered symbolical of the pope's temporal authority.



TIARA OF THE POPE.

Tī'ber, river of Italy, passing through Rome, the largest stream of the peninsula proper; rises in Mount Fumaiolo, Tuscany, at an elevation of 3,830 ft., flows S., and empties into the Mediterranean 22 m. below Rome; length, 260 m.; breadth at Rome, 250 ft. The principal affluent is the Nera, which descends from the Sibylline Mountains, and enters on the left about 100 m. from the mouth; above it and on the same side enters the Clitunno (*Clitumnus*), praised by the Latin poets, and below the Anio. On the right the most important affluent is the Chiana, connected by canal with the Arno. The Tiber is navigable for small steamers to the mouth of the Nera, and for larger ones to Rome. The floods of the Tiber have been formidable from the foundation of Rome for their suddenness and the large amount of sediment carried. The Romans called the river *flavus* because of the yellow clay it carries. This has gradually extended the delta of the Tiber until the ancient port, Ostia, is now 4 m. inland, and the port of Trajan is a marsh. The growth at the principal mouth for the last eight hundred years has been 10 ft. a year.

Tiberias, Lake of. See GENNESARET, LAKE OF.

Tibe'rius, 42 B.C.–37 A.D.; Emperor of Rome. His full name was Tiberius Claudius Nero Cæsar. He was the eldest son of Claudius Tiberius Nero and Livia Drusilla, who were divorced in order that the latter might marry Augustus. Tiberius made his first campaign in the Cantabrian War. In 20 B.C. he went to Asia Minor and restored Tigranes to the throne of Armenia; and in 15 he and his brother Drusus carried on a war against the Alpine nations of Rhætia. In 11 he conducted the war against the revolted Dalmatians and the Pannonians. The death of the two older grandsons of Augustus virtually left Tiberius the succession to the throne, and in 4 A.D. he was adopted by Augustus. He conquered all Illyricum, gained victories over the Germans and the Dalmatians, and in 12 celebrated his fourth triumph. In 14 he succeeded Augustus.

The first years of his reign were marked by prudence and moderation; but under the influence of Sejanus, his favorite, the natural severity of his temper began soon to degenerate into cruelty. A secret organization of spies was formed, and their machinations exposed the life, the fortune, and the honor of every Roman citizen to hourly danger. In 27 he retired to the island of Capreæ (Capri), near Naples. His last years were spent in the most infamous pleasures, and Capreæ became the haunt of debauchery. Henceforth Sejanus had the full control of affairs of state; but Tiberius, who had been suspecting him for some time, caused him and his whole family to be destroyed in 31. Tiberius wrote a commentary of his own life, Greek poems, an ode on the death of L. Cæsar, and several epistles and orations. The unfavorable estimate of Tiberius is mainly due to the comments of Tacitus—a bitter critic of the imperial system, and is possibly exaggerated.

Tibet' (called by the natives BOD or BODYUL, and BHOT and BHOTIYA in India), the high table-land, buttressed on the N. by the Kuenlun or Kulkun and Altyn Tagh ranges, which marks a sudden descent to the deserts of E. Turkestan and Gobi, and on the S. by the Himalayan range and British India. It is one of the least-known countries of the world. Its area (463,200 sq. m.) can only be vaguely estimated, vast portions are as yet unexplored, and present geographical knowledge is based largely on the Jesuit survey (1708–18) and on the route surveys of travelers. Pop. est. at 6,500,000. Lhasa, the capital, has from 15,000 to 20,000 inhabitants.

The dip and drainage of the Tibetan plateau is generally E., so the highest part is the W., where it adjoins Kashmir. Here its mean level is 16,000 to 17,000 ft. above sea level, and in the SW. angle there spring three great rivers—the Sutlej, Indus, and Sanpur—which burst through the Himalayan chain on their way to the Arabian Sea and Bay of Bengal. The last of these rivers flows through Great or S. Tibet in an E. direction for 1,000 m. before it turns S. and, piercing the Himalayas, emerges into British territory as the Brahmaputra. A large belt of country N. of and parallel to the valley of the Brahmaputra is drained by another river which connects a chain of lakes and flows away to the E. It is believed to be the upper course of the Salwen. In N. and E. Tibet lie the sources of the Mekong or Cambodia River and those of the great Yang-tse-kiang and Hwang-ho of China. The lower courses of the Sanpur or Brahmaputra and Salwen drain the most populous part of Tibet; most of the remainder of the country being too bleak and unproductive to support life. An interesting analogy between the Andes and the Himalayas was perceived by Warren Hastings. Both the mountain masses of the Old and New World consist of three parallel chains; in both great rivers rise in the inner chain and force their way through the other two, while smaller rivers rise in the central cordillera and after lateral courses force their way through the outer chain. In both Peru and Tibet the staple product is wool, conveyed by the llamas and sheep used as beasts of burden.

The chief mineral products of Tibet are gold, silver, salt, and borax; the metals first named are fairly plentiful, but jealousy against foreign intrusion prevents any systematic working and export. Among the principal domesticated animals are sheep, horses, yaks, and mastiffs, while the wild fauna comprise bears, antelopes, musk deer, and wild asses, and on the extreme N. confines wild camels are found.

The great staple of the country is wool, a fine quality of which is largely produced, and in 1893, as well as after the British invasion of 1904–5, important trade concessions were obtained.

The climate is of Arctic rigor, and only the hardier cereals can be raised in the valleys. The inhabitants of Tibet, about 5,500,000 to 6,000,000 in number, are Mongolians, with small, contracted black eyes, thin beards, high cheek bones, flat noses, wide mouths, and thin lips. The skins of the upper classes are as white as those of the Europeans, but the ordinary complexion is tawny. They are of middle height, and combine agility and suppleness with force and vigor. They are said to be brave in war, though the inferiority of their weapons and ignorance of the art of war place them at an enormous disadvantage. The literature of Tibet includes translations of all the Buddhist scriptures. Printing by wooden blocks has been known for centuries. The old religion, Bon or Pon, still lingers, and appears to be a worship of the powers of nature. Buddhism reached Tibet in the seventh century from India and China, and the religious hierarchy is now foremost in national affairs. Tibet is divided into the four provinces of Kam, U, Tsang, and Ari.

The foreign relations of Tibet since the eighteenth century have been subject to China, and two Chinese residents are at the capital. The dalai lama on attaining full age has in times past been invested with supreme authority by the Emperor of China, but for some years all the grand lamas have died in infancy, a circumstance that sheds a significant light on the methods resorted to by those who wish to keep the power in their own hands. The position of the grand lamas has thus been very similar to that of the popes of Rome, and the analogy is still more observable in the tenets and rites of the Roman Catholic and Tibetan religions, between which there is a striking similarity, probably due to the early Capuchin missionaries who settled in Lhasa having introduced a knowledge of Catholic observances. The gylongs (monks) and annis (nuns) are found in huge monasteries, presided over by abbots and scattered all over the kingdom, and indirectly possess much influence; the actual executive authority is, however, vested in jongpons, or district officers, under the supervision of the provincial governors.

It is said that a native king established the government at Lhasa in 617 A.D., and commenced the translation of the Buddhist scriptures, but the early history of Tibet is obscure. The Buddhist monks finally gained the ascendancy, and during this period (1316–30) the first European, Friar Odoric, of Pordenone, visited Lhasa. The first of the Jesuits who penetrated into Tibet was Antonio Andrada, who in 1624 set out from Agra and, scaling an appalling mountain, reached Rudok, in Tibet, and eventually made his way through Tangut to China. Other missionaries followed. A mission of Capuchins was established at Lhasa in 1719, but they were expelled in 1760. The unfortunate policy of the British under Lord Cornwallis led to the closing of the passes from Tibet into India, all the good results of Hastings's negotiations being thereby lost. Nevertheless, Thomas Manning, the friend of Charles Lamb, in the guise of a doctor, managed in 1811 to get to Lhasa through Bhutan, a success doubtless due to his knowledge of Chinese. In 1844 the French missionaries Huc and Gabet arrived at Lhasa and were well treated by the new regent, who had been installed in the place of one Si-fan, who had been disgraced for complicity in the murder of three of the dalai lamas. Subsequently Chinese jealousy prevailed, and Huc and Gabet were compelled to return to Europe.

Tib'ia. See Leg.

Tibull'us, Albius, b. abt. 54 B.C.; Roman poet; of an equestrian family. Four books of elegies are attributed to him, but only two are undoubtedly his. These, by the genuineness and simplicity of their feeling, belong to the best Latin literature contains.

Tic Douloureux', a form of facial Neuralgia (*q.v.*).

Tich'borne Tri'al, the most celebrated conspiracy case, and the first in English legal records in which the impostor assumed identity with a known person. Roger Charles Tichborne, b. 1829, was, after his father, heir to the title and estates of his uncle, Sir Edward. Roger in 1854 sailed from Rio de Janeiro for New York in the ship *Bella*, which was lost. Sir Edward died, March 5, 1853, and was succeeded by his brother James, Roger's father, who died, June 11, 1862. In the presumed loss at sea of Roger, Sir James was succeeded by his second son Alfred, who died February 22, 1866, and was succeeded by a posthumous son, born May 28th. In 1865 Lady Tichborne, widow of Sir James, advertised in English and Australian newspapers for her son Roger, whom she believed to be alive. In 1866 a butcher in Wagga Wagga, Australia, Arthur Orton, but then calling himself Thomas Castro, asserted that he was Roger Charles Tichborne, and had been saved from the wreck. He visited Lady Tichborne, and she accepted him as her son.

Lady Tichborne died, March 12, 1868. On May 11, 1871, the trial for the recovery of the Tichborne estates, valued at £24,000 a year, was begun. After sitting one hundred and three days the jury declared themselves satisfied that the claimant was not Roger Tichborne. In 1874, after a trial lasting one hundred and eighty-eight days, the claimant was found guilty of perjury, and sentenced to fourteen years' penal servitude. Orton was proved to differ from Roger Tichborne in important particulars. He was grossly fat, illiterate, and ignorant of notorious facts in Tichborne's life, while the latter was thin, shorter, and well educated; yet his enormous expenditures were paid by public subscriptions, and efforts in his behalf were long continued. In 1895 he publicly confessed his fraud and impersonation.

Ticino (tē-chē'nō), French Tessin, the southernmost canton of Switzerland, on the Italian side of the Alps and on both sides of the river Ticino; borders on Lago Maggiore; area, 1,088 sq. m. Its N. frontier toward Uri and Grisons is formed by a range of the Lepontine Alps, 12,000 ft. high, branches of which cover the whole N. part of the canton. In the S. part the ground becomes low and the surface level. Dairy farming and cattle breeding are the principal occupations in the Alpine regions, and agriculture and the cultivation of grapes, olives, figs, almonds, and melons in the S. part. Pop. (1905) 143,180, most of whom speak Italian and are Roman Catholics; capital, Bellinzona.

Tick'et of Leave, originally a kind of permit or license given to British convicts transported to the Australian colonies, by which they were allowed to be at large within a certain territory. It is now an order of license, whereby a portion of a convict's time of imprisonment is remitted as a reward for good behavior.

Tick'nor, George, 1791-1871; American historian; b. Boston; graduated Dartmouth College, 1807; admitted to the bar, 1813; spent four years (1815-19) in study in Europe; Prof. of Modern Languages, Harvard, 1820-35, when he resigned; spent three years in Europe, chiefly engaged in researches for his principal work; published, 1849, his "History of Spanish Literature," which was translated into French, German, and Spanish, and accepted as the standard work even in Spain; wrote an elaborate "Life of William Hickling Prescott" (1864).

Ticknor, William Davis, 1810-64; publisher; b. Lebanon, N. H.; became in 1832 a bookseller in Boston; subsequently added a publishing business, which attained to great importance under the firm name of Ticknor & Fields; published *The Atlantic Monthly* and *The North American Review*, and made his office a center for the brilliant literary circle connected with that magazine, including Longfellow, Holmes, Whittier, Lowell, and Saxe, whose poems were issued by the firm.

Ticks, parasites of the higher animals. The true ticks belong to the Arachnida, order *Acarina*. They fasten upon the skin, and, burrowing the head beneath the surface, feed upon the blood, the abdomen meanwhile growing to enormous size. The name is also given other parasites belonging to the *Diptera* (flies), as the sheep tick, horse tick, and bird tick, and in some of these parasitism has resulted in a loss of wings, the animal having a spiderlike appearance.

Ticondero'ga. See Fort Ticonderoga.

Tides, the motions of the waters of the ocean arising from the attraction of the sun and moon. For six hours the water rises, or *flows*; then, remaining stationary for a short time, it recedes or *ebbs* for another six hours; after a short lull, called *slack water*, it again rises and falls as before. The rising sea is called the *flood tide*; the receding sea, the *ebb tide*. When the water is at its greatest height, it is *high water*; when at its lowest point, *low water*. There are thus daily two high tides and two low tides. The mean interval of time between two consecutive high tides or low tides being really twelve hours and twenty-six minutes, the hour of the day at which high water or low water occurs is later every day by about fifty-two minutes.

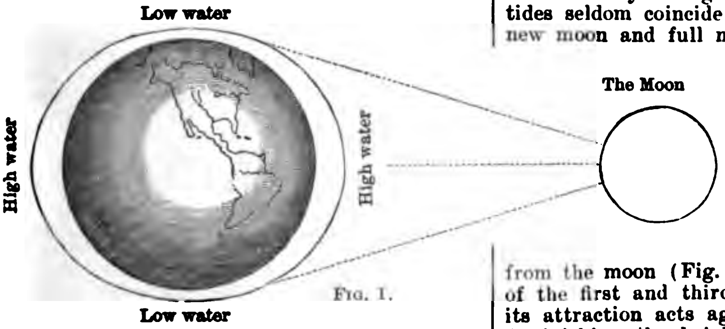


FIG. 1.

Though the dependence of the tides upon the course of the moon seemed to point out their source, their real cause was not understood before the discovery of the law of gravitation. Newton showed that the rise of the waters was due to the attraction of the moon and the sun upon the revolving globe of the earth. The moon, on account of its proximity, has an influence more than double that of the sun (100 to 38); its action is illustrated by Fig. 1. It attracts the solid earth as if the whole mass of the earth were concentrated at its center. But owing to the greater proximity of the region marked in the figure "high water" to the moon, the attraction is there greater than for the center of the earth. Hence a tendency to a high tide in that region. On the side opposite the moon, also marked high water, the attraction is less than at the center of the earth. Hence the attraction draws the earth away from the water toward the moon, so that a high tide is produced there also. At the points marked low water the components of the forces shown by the dotted lines converge toward the moon. But for this convergence the attraction of the moon on the solid earth and on the water would be equal. But owing to the convergence the water is drawn toward the center of the earth, and thus low tides are produced. There are thus always simultaneously and directly under the moon two high waters opposite each other, and two low waters at equal distances between them. Owing to the rotation of the earth, this permanent system of swells and troughs travels from E. to W. over every part of the ocean and of its coast.

The sun also asserts its attractive power on the ocean, and causes a similar system of four daily tides. Owing, however, to the great distance of the sun, the solar tides are much smaller, and mostly merged in the lunar tides. As the relative position of the moon and sun is constantly changing, the solar and lunar tides seldom coincide; but twice a month, at new moon and full moon, the sun and moon, being on a line with the earth, act together, and cause an unusually high water, which is the sum of the lunar and solar tides. These are the spring tides. High water is then highest, and low water lowest. When the sun is placed 90° from the moon (Fig. 2)—that is, at the time of the first and third quarter of the moon—its attraction acts against that of the moon, diminishing the height of the high tide and increasing that of low water. These are the neap tides. High water is then lowest, and low water highest. The proportion of the rise and fall in the spring tides and neap tides is nearly as 7 to 3.

If the ocean covered the whole earth with a uniform depth of water, the tidal wave, with its long crest extending from N. to S., would follow the apparent course of the moon, and travel from E. to W. around the globe in twenty-four hours. It would be greatest in the equatorial regions, and move there with a velocity of over 1,000 m. an hour. But the continents which cut the ocean into several large basins oppose its passage, and in each of these basins the course of the tidal wave is subjected to great modifications. The regularity and velocity of the tidal wave depend upon the size of the basin, the depth of the water, and freedom from all obstacles opposing its progress. Nowhere are these conditions better fulfilled than in the S. half of the Pacific. There is formed what might be called the parent tidal wave, which, advancing rapidly westward, enters the Indian and Atlantic oceans, and seems to control their tides.

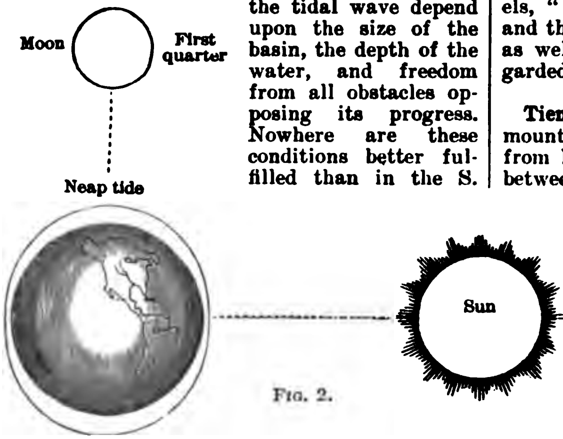


FIG. 2.

The height of the tide depends upon local circumstances. In the midst of the Pacific it is scarcely more than from 2 to 5 ft. But when dashing against the land and forced into deep estuaries, the accumulating tide waters reach a great height. On the E. coast of N. America, which is directly in the path of the great Atlantic wave, the tide rises on an average 9 to 12 ft. In the Bay of Fundy, which receives the full wave, the tide, which at the entrance is 18 ft., rushes with fury into that long and narrow channel, and swells to the height of 60 ft., and even to 70 ft. in the highest spring tides. In the Bristol Channel, on the coast of England, the spring tides rise to 40 ft., and swell to 50 in the English Channel at St.-Malo. It is obvious that differences so considerable in the level of the water will cause strong currents, constantly varying in force and direction with the tide. To the same cause may be traced the dangerous whirlpools which have long been celebrated on various coasts. The famous maelstrom off the Norwegian coast is but a tidal current rushing with violence between two of the Lofoden Islands, causing a whirling motion which is reversed at every new tide. Such, too, in the Straits of Messina, are the classic Scylla and Charybdis, so much dreaded by the navigators of old, and many other whirlpools of less celebrity.

Tieck (tēk), **Ludwig,** 1773-1853; German author; b. Berlin. He early became known as a writer of fantastic tales, especially by "Peter Lebrechts Volksmärchen," which combine the simplicity of the old legends with grotesque satire upon modern subjects. He satirized the classicists in several works. Between 1799 and 1802 he published "Das Leben und Tod der Genoveva," his finest drama, his admirable translation of "Don Quixote," and, with A. W. von Schlegel, the "Musenalmanach." He afterwards lived for several years in Rome, Munich, and England, and in 1820 went to Berlin, where he exerted great influence on the drama. In 1826 appeared his novels, "Dichterleben," "Der Tod des Dichters," and the unfinished "Aufruhr in den Cevennen," as well as translations of plays which he regarded as early works of Shakespeare.

Tien'-Shan ("celestial mountains"), a lofty mountain chain in central Asia, in lat. 42° N. from lon. 70° to 90° E., forming the boundary between the Balkash basin and that of the Kashgar and Tarim, and lying partly in the Russian provinces of Syr-Darya and Semirechensk and partly in Chinese Turkestan. There are several summits which reach 15,000 to 18,000 ft. The highest peak is Khan-Tengri (24,000 ft.), on the Russo-Chinese boundary.

Tientsin (tē-ĕn'tsēn), literally "Heaven's Ford," a walled city and river port of Chihli, in China; capital of a department of the same name. The city is at the junction of the Grand Canal with the Pei-ho, 80 m. SE. of Pekin. Next to Pekin it is the most important city of the province. Prior to 1872 it was merely a *wei* or military station for the protection of the river traffic. The city itself is comparatively small, its walls having a circuit of 3 m., but its suburbs are extensive, and in them most of the business is transacted. The streets are narrow and filthy, and the buildings lack interest or beauty. Tientsin was designated in the treaty made here in 1858 as a treaty port, but was not opened until January, 1863. The foreign settlement is 2 m. below the city, and consists of three "concessions," the French, nearest the city, then the British (the largest and most important), and lastly the "American." City, suburbs, and settlements are inclosed in a circular rampart, known as "San-ko-lin-sin's folly," because thrown up in 1858 by the Tartar general, Sŭng-ko-lin-sin as a defense against tne British. Though the river is frozen over from the early part of December to the middle of March and later, the trade of Tientsin is considerable. Pop. est. at 750,000.

Tierra del Fuego (tē-ĕr'rä dĕl fwä'gō), an archipelago at the S. extremity of S. America, separated from the continent by the Strait of Magellan; length from NW. to SE. about 400 m. Of the total land area (21,000 sq. m.) at least four fifths is included in the large island called King Charles S. Land, Tierra del Fuego, or Fuegia. W. and S. of this are Desolation, Clarence, Navarin, Wollaston, Dawson, Londonderry, and smaller islands and islets, all separated from the larger island and from one another by tortuous channels; a group of the S. end, separated by the navigable Lemaire Channel, includes Horn Island and Cape Horn; and the Isla de los Estados is somewhat outlying, toward the SE. N. of the W. mouth of the Strait of Magellan a group of very similar islands lines the coast; they belong, physically, to the Tierra del Fuego group, but those between the strait and Wellington Island are distinguished as the Madre de Dios Archipelago. The Andes are continued into Tierra del Fuego; some of the peaks are over 6,000 ft., but there are no active volcanoes. The bases of the mountains are covered with pine forests and numerous glaciers. All the islands are cut by deep fiords, affording magnificent scenery. Gold has been found in paying quantities. The climate is damp, changeable, and subject to violent storms and severe cold, especially from June to October. By the treaty of 1881 that portion of the archipelago lying E. of lon. 68° 34′ W. is held by the Argentine Republic; there are two or three small civilized settlements. The remaining surface belongs to Chili; at present it is unsettled. The Indian inhabitants belong to three distinct races, but are classed together as Fuegians; all are savages of a low grade, but inoffensive, subsisting on fish, seals, etc. They number about 8,000. Fernando de Magalhães (Magellan) discovered the archipelago in 1520. It is said that he named it, in allusion to the smoke from Indian watch fires, *Tierra de Humos* (land of smoke), and that Charles V changed this to Tierra del Fuego (land of fire).

Tier′ra Fir′me. See SPANISH MAIN.

Tiflis (tĭf-lēs′), government of Russia; bounded N. by the Caucasus and S. by Turkey in Asia; area, 15,776 sq. m. Tiflis is a mountainous region, covered with forests of oak, chestnut, and maple. The valleys are fertile, and produce tobacco, cotton, indigo, wheat, and all the fruits of S. Europe. Pop. (1907) 1,097,600, mainly Georgians, Armenians, Russians, and Tartars. Capital is Tiflis, the former capital of Georgia, on the Koor. It carries on simple manufactures, and is famous for its workers in metals. It is the center of S. Caucasian commerce between Russia, Persia, and Europe. Trade is mostly in the hands of Armenians. It was almost totally destroyed by Mehemet Khan (1795), and was ceded to Russia by its last king, George (1801). In the vicinity are naphtha and thermal springs, the latter much frequented. Pop. abt. 160,000.

Ti′ger, the name applied to certain quadrupeds. (1) Primarily and of right it belongs only to the *Felis tigris*, one of the largest of living *Felidæ*, about equal in size and superior in strength to the largest lions, and more destructive and far more dangerous to man. Tigers have been known to measure over 10 ft. in length, including the tail, and to weigh over 500 lb. It is peculiar in the development of spreading thick, whiskerlike hairs on the sides of the head; its tail is elongate and smooth-haired, and the color is a tawny yellow transversely striped with black. It ranges N. into S. Siberia, and S. as far as the Spice Islands. E. and W. its habitat extends from Persia to the Pacific. It prefers forests and jungles near river banks for its abode, and pounces upon the cattle and other animals that come to drink. It is much dreaded by man, especially in India. The tiger has been induced to hybridize with the lion in captivity. Old tigers sometimes acquire a fondness for human flesh, and are then called "man eaters." The hunting of the tiger from the backs of elephants is a favorite though perilous sport in Oriental lands. (2) The name is also sometimes applied to the American jaguar. (3) It is further transferred in Van Diemen's Land to the striped *Thylacinus cynocephalus*, a carnivorous marsupial.

Tiger Cat, any one of a large number of striped and spotted wild-cats, mostly rather small tropical animals, often arboreal in their habits.

Tig′lath-Pile′ser. See ASSYRIA.

Ti′gris, river of Asiatic Turkey. As HIDDEKEL, it was one of the four rivers of Eden. It rises in the mountains of Kurdistan, only 4 m. from the Euphrates. After a winding but generally SE. course of about 1,000 m. it joins the Euphrates at Korna. Together they form the Shatt-el-Arab which empties into the Persian Gulf nearly 100 m. distant. On its banks are Diarbekir, Mosul, and Bagdad, and the ruins of Nineveh, Seleucia, Ctesiphon, and Opis. Its banks above Diarbekir afford pasturage to nomad tribes, and below Diarbekir are finely cultivated as far as Mosul. There the land becomes a desert. From Bagdad to Korna the banks are steep and overgrown with reeds and brush, sheltering beasts of prey. The upper Tigris as far as Mosul is navigable only by rafts, and thence by small vessels to Bagdad, to which steamers of light draught ascend from the Persian Gulf. During a brief period (114–117) it formed the boundary between the Parthian and Roman empires.

Til′den, Samuel Jones, 1814–86; American statesman; b. New Lebanon, N. Y.; studied at Yale and Univ. of New York; admitted to the bar, 1841. He became prominent as an able champion of Van Buren's administration, and won a high place in his profession, amassing by a judicious investment of his earnings one of the largest fortunes ever accumulated in legal practice. He was a member of the convention for a revision of the constitution of the state in 1846, and again in 1867. He also served two terms in the state legislature—first in 1846 and second in 1872. He was one of the foremost in the overthrow of the Tweed ring. In 1874 he was chosen Governor of the State of New York. He exposed the iniquities of the canal ring and conducted a successful reform administration. In 1876 he was nominated by the National Democratic Convention for the Presidency of the U. S. At the election he received a much larger popular vote than any other candidate and 184 uncontested electoral votes. Only one additional electoral vote was required for his election, while twenty additional votes were required for the election of the rival candidate. Owing to differences of opinion as to the proper mode of counting electoral votes and passing upon contested returns, the settlement of the matter was intrusted by Congress to the Presidential Electoral Commission, which decided in favor of the Republican electors in every contested case, and certified to the election of Rutherford B. Hayes. The Democratic Party continued to regard Tilden as its candidate for the succeeding election in 1880, but he was obliged by failing health to withdraw from public life. Tilden bequeathed the bulk of his property for the establishment of the Tilden Trust to found a free library and reading rooms in the city of New York.

Tiles, originally flat slabs of baked clay. There are now in common use roofing tiles, tiles for walls and floors, and drainage tiles. Wall tiling, with the figures in slight relief, has been used in Persia since antiquity. Encaustic is the trade name for tiles made of different colored clays inlaid upon a clay background and fixed together. See also MOSAIC.

Til'lotson, John, 1630–94; English prelate; originally a Puritan, but at thirty years of age took orders in the English Church, and became celebrated as a preacher. He was the leading member of the commission of twenty divines appointed in 1689 to examine and revise the liturgy. On the accession of William III he was made dean of St. Paul's, and in 1691 Archbishop of Canterbury. He published " The Rule of Faith " and several volumes of sermons.

Til'ly, Johann Tserklaes (Count von), 1559–1632; general of the Thirty Years' War; b. in the castle of Tilly, province of Brabant, Belgium; being a younger son, was destined for the Church, and educated by the Jesuits, but preferred the military profession; served under Parma in the Netherlands, and under Duke Philip Emanuel of Lorraine in Hungary, and was in 1610 appointed field marshal by Duke Maximilian of Bavaria. When the Thirty Years' War broke out, he was commander in chief of the army of the Holy League; suppressed the insurrection in Bohemia after the battle of Prague, November 8, 1620; won the battles of Wimpfen and Höchst in 1622, and Stadtlohn in 1623, and drove the Protestants from the Palatinate. He defeated Christian IV at Lutter, 1626, and with Wallenstein forced the Protestants to the Peace of Lübeck. Appointed commander in chief also of the imperial army after the dismissal of Wallenstein in 1630, he stormed Magdeburg May 20, 1631. The brutal outrages committed by the Walloons and Croats on entering the city have left a stain on Tilly's reputation, though it is questionable how far he was responsible for them. He was utterly defeated by Gustavus Adolphus at Breitenfeld, 1631, and again on the Lech, 1632, in which battle he was mortally wounded.

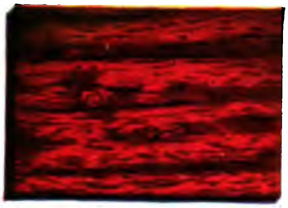
Til'sit, town of Prussia; on the Niemen; 65 m. NE. of Königsberg. It is regularly built, and in a fertile and well-cultivated district. It manufactures cloth, hosiery, oil, paper, chemicals, has sugar refineries and important fisheries for eel and salmon, and has trade in grain, hemp, flax, wool, and horses. It is famous for the Treaty of Tilsit concluded between Napoleon and the Czar Alexander in 1807 after the humbling of Prussia by the French. By this peace the foundation was laid for a Russian-French alliance, and Prussia lost nearly half of her territory. Pop. (1900) 34,539.

Tim'ber and Timber Trees, wood suitable for constructive purposes, or for furniture, tools, and the like; also the trees furnishing such material. The most prominent species of timber trees used in the U. S. are the following:

The most important, and for its uses the best in the world, is white pine (*Pinus strobus*), in England called Weymouth pine. Hard-pine lumber, variously called yellow pine, pitch pine, etc., is most largely furnished, and of best quality, by *P. palustris,* the long-leaved pine of the S. states. The N. pitch pine furnishes a similar but inferior timber; and excellent hard pine is yielded by the short-leaved pine; while the loblolly pine at the S. and the red or Norway pine at the N. furnishes a softer and less resinous lumber. Larch or hackmatack of the N. furnishes a valuable lumber for shipbuilding. Next are the spruces, with wood tougher than white pine, but more liable to shakes and splits. Black spruce is prized for spars. White spruce is smaller and inferior. Hemlock spruce furnishes at the N. a valuable but coarse lumber. Of the cypress tribe, the bald cypress of the S. states furnishes lumber of great size and much durability, but light and shaky; while the arbor vitæ or white cedar of the N. and that of the Middle and S. states yields small timber of exceeding durability, especially for posts; and red cedar furnishes a fine-grained wood of durability and value.

In the Pacific states and Rocky Mountain region the coniferous trees are numerous, and some are of immense height and girth. Of soft-wooded or white pines no one equals the white pine of the E. The sugar pine, with its immense trunks, takes its place, but the wood is coarser grained. For spruces, the Douglas spruce of Oregon and California is the best, as well as the largest. The cypress tribe is represented by several cypresses of value; also in Oregon and N. by an arbor vitæ vastly surpassing the E. species in size and value for timber, and in California by the famous redwood, the light wood of which is incomparable for building.

Of oaks, the most valuable species is the white oak. It grows 80 to 100 ft. and has a diameter of 6 or 7 ft., and yields handsome logs. The wood is of a pale reddish color, straight grained, compact, tough, strong, durable, and shrinks but little. It is used for frames of structures where strength and durability are required, coach making, shipbuilding, and a great variety of purposes. The other species come next to this in value—*viz.*, chestnut-oaks, post-oak, bur-oak, etc. In the S. states, along the coast, the live oak is prized for shipbuilding above all others, but it does not give large timber. Its height is from 40 to 50 ft.; diameter, 1 to 2 ft. The wood is yellowish when first cut, and deepens to a dark brown with age; it is hard, tough, strong, heavy, and difficult to work, as the grain is waved or twisted.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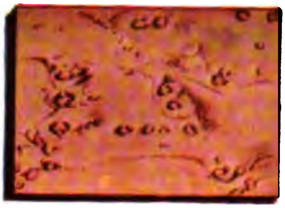
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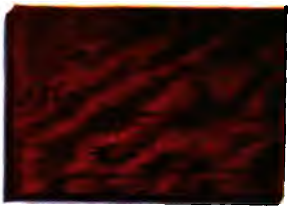
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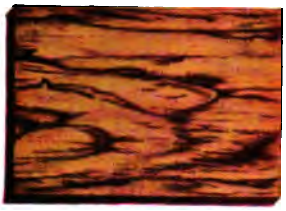
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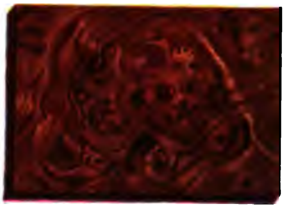
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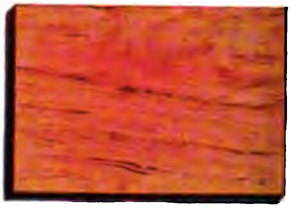
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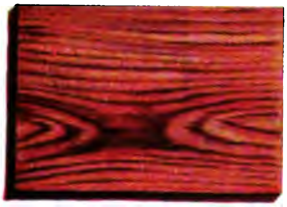
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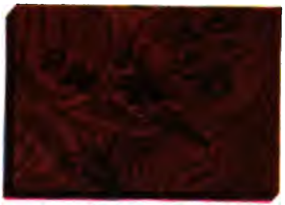
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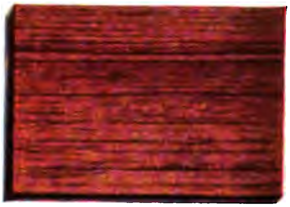
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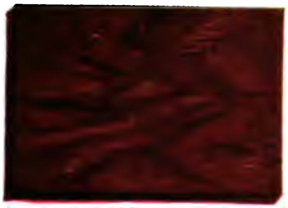
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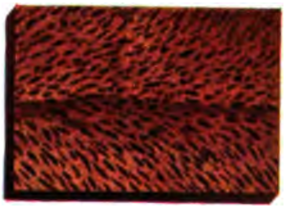
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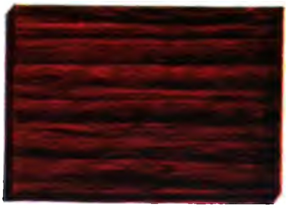
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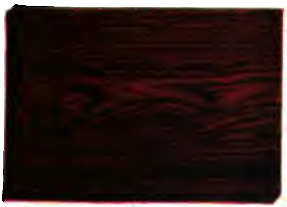
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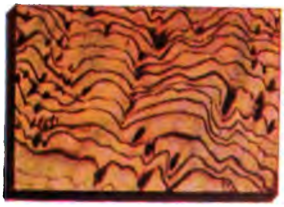
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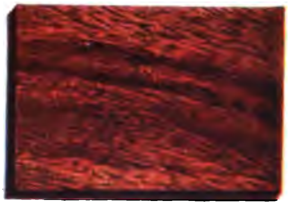
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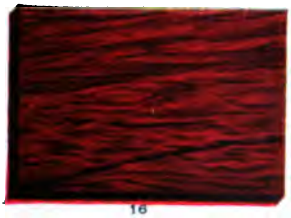
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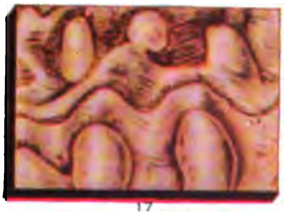
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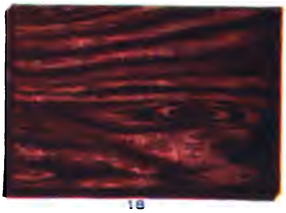
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CABINET WOODS.

1. Paduk Wood (Pterocarpus indicus)
2. Olive-wood (Olea europæa)
3. Rosewood (Physocalymna scaberrimum)
4. Violet Wood (Acacia homalophylla)
5. Polisander Wood (Jacaranda brasiliana)
6. Sandal-wood (Pterocarpus santalinus)
7. Bird's-eye Maple (Acer)
8. Amboyna Wood (Pterocarpus indicus)
9. Arbor Vitæ (Thuja occidentalis)
10 Sycamore (Ficus Sycamorus)
11 & 12. European Ash, different sections (Fraxinus excelsior)
13. Amaranth Wood (Copaifera bracteata)
14. Boxwood (Buxus sempervirens)
15. Red Cedar (Juniperus virginiana)
16. Red Sandal-wood (Adenathera pavonina)
17. New Guinea Wood (Afzelia bijuga)
18. King-wood (Machærium violaceum)

The pores are minute, and the silver grain bright and distinct. The biennial-fruited oaks have more porous wood, unfitted for casks, less durable, and less strong. The best—*viz.*, black oak—is found on poorer soils than the white oak, and grows 80 to 90 ft., with a diameter of 4 to 5 ft. The wood is reddish, porous, and coarse-grained. The outer bark is greatly used for tanning, and the inner bark, called quercitron, for dyeing. Spanish oak and willow oak are superior; and so are laurel or shingle oak (so called because used for shingles). California and Oregon have oaks of peculiar species, some valuable, but none which equal white oak. Chestnut is a large tree, of the Atlantic states only, essentially of the same species as the European, yielding a coarse-grained and porous but durable lumber, easily worked, and valuable for wainscoting, etc.

The American beech has a very close-grained and hard wood, of which joiners' tools are made. Ironwood and horn beam, as the names denote, have very hard wood, but they are small trees, peculiar to the Atlantic states. The hickory is peculiar to the Atlantic states. The shell bark or shag bark is the best, but all have a tough and hard wood of remarkable strength, much prized for tools and the like. The walnut is known in the Atlantic states by two species—*i.e.*, white walnut or butternut, the favorite wood for gunstocks and cabinetwork, but a small tree; and black walnut, the most important of native woods for the cabinetmaker. The heart wood is of a violet color when first cut, but upon exposure becomes dark. It is far superior to the European walnut; it is strong, tough, durable when seasoned, and not apt to warp and split. It has a fine and compact grain, and is susceptible of a high polish. The birches are valuable timber trees of the second class, having a hard and fine-grained wood. The black or sweet birch, sometimes called cherry birch, is most prized, being excellent for furniture; and yellow birch is equally good, but lighter in color. Poplars or cottonwoods make large trees, as do some willows, but the wood is weak, soft, and usually of no durability.

Plane tree, buttonwood, or sycamore attains great size, but soon becomes hollow. The laurel family is represented in the East by the sassafras, and in California by a laurel the wood of which is extremely beautiful. White elm is a large tree, with handsome but not very durable wood. Slippery elm is a smaller tree, and the reddish wood is tougher. The ashes are timber trees of the first class. The yellowish wood is very firm and tough, but comparatively light, straight grained, and easy to work. White ash is the best, and is unexcelled for strength, elasticity, and durability, and it is preferred to chestnut for interior finish. Black ash, a smaller tree, has tougher wood, easily separable into layers, used for hoops and strong basket work. American holly of the Atlantic states has a very fine grained and compact white wood, used for ornamental cabinetwork, wooden screws, etc. The Kentucky coffee tree is a stately tree, of peculiar aspect, with handsome rosy or brownish wood, suited for cabinetwork. Honey locust is of little account, but the true locust affords a timber equal to live oak in durability, especially valued for ships. Maples are fine trees, of which the sugar maple is the most valuable, having a hard and close-grained wood, of light color and silky luster when polished, and the varieties called curled and bird's-eye maple are prized for cabinetwork. The soft maples, so called from the character of their wood, are the white or silver maple and the red or swamp maple, the former a large and the latter a medium-sized tree, the wood of which is used for lasts, for carvings, etc. Lindens or limes, in the U. S. called basswood, are first-class forest trees for size, and their soft and white fine-grained wood is excellent for various purposes where lightness with moderate strength is demanded. Tulip tree, sometimes called whitewood or poplar, has a light and soft wood, like that of the linden, but more valuable.

The exotic timber trees of Europe are analogues of those of the U. S.—*i.e.*, different species of pine, larch, spruce, oak, beech, elm, ash, linden, etc., only the chestnut being the same or nearly so—but are far fewer in species and in kind, tulip trees, gum trees, locusts, hickories, sassafras, bald cypress, redwood, etc., being wholly wanting. As to foreign woods of tropical regions imported for the use of cabinetmakers—such as mahogany, Spanish cedar, rosewood, lignum-vitæ, and the like—they are mostly treated under their names. See FORESTRY.

The original forest acreage of the U. S. of 850,000,000 has been reduced to 550,000,000. About one fifth of the standing timber of the country is held by the Federal Govt. in national forests, Indian reservations, national parks, and unreserved public domain, and by the states in state reserves. The value of the forest products of the U. S. in 1907 was about $1,280,000,000. The U. S. uses 250 cu. ft. of wood per capita annually, Germany uses 37 cu. ft., and France 25. See WOOD; PRESERVATION OF TIMBER; FORESTRY.

Timbuk'tu (formerly TIMBUCTOO), town in the military territory of French Sudan, central Africa; 10 m. N. of the Niger, near the desert of Sahara. It is in an unhealthful and unproductive district; provisions have to be brought to it from distant places; but for the traffic between N. and central Africa it is of importance; and although it has repeatedly suffered from being conquered and sacked by the Moors and by neighboring tribes, it has always risen again and is still increasing. Dates, European goods, gunpowder, tobacco, and paper are brought here through Sahara and exchanged for gums, ostrich feathers, gold dust, and palm oil. The rapid development of its commerce has been hindered by the jealousy between the British and French merchants. The town is poorly built of one-story mud huts, and, with the exception of a mosque dating from 1325, contains few buildings worth noticing. It was formerly surrounded by walls. The inhabitants, variously estimated at from 5,000 to 20,000, are indigenous negroes, but mixed with other races. The city seems to date back to the twelfth century, but was visited by no European until Laing reached it in 1826.

Time. Measurements of long periods, months, and years depend on astronomical phenomena, especially the motions of the sun and moon. Measurements of fractions of a day are made by observing the direction of the sun, or in our time by clocks and watches.

The longest unit of time which can be determined directly by observation is the year. This is the time occupied by the earth in one revolution around the sun; but there is a slight ambiguity as to the time when a revolution shall be regarded as complete. The sidereal year, which is properly that of the earth's revolution, is slightly longer than the solar year, on which the seasons depend. Since it is the change of seasons which fixes the length of the year for practical purposes, the solar year is that used both in astronomy and in daily life. The next shorter unit of time is the lunar month or the interval between one new moon and the next. As this interval is neither an entire number of days nor an aliquot part of a year, it is no longer used as a measure of time. It has given way to the calendar month. The most exact measure of all is the day, because the time of the earth's revolution on its axis remains unchanged from century to century. If it varies at all the change does not amount to one thousandth of a second in a century. The time of one revolution of the earth on its axis is called the "sidereal day" because it is equal to the interval between two passages of a star across the meridian of a place. Owing to the annual revolution of the earth around the sun the sidereal day does not coincide with the interval between two transits of the sun over the meridian. If the sun and the star cross at the same moment to-day, the sun will be nearly four minutes later than the star in crossing to-morrow. In the course of a year the number of revolutions which the earth actually makes on its axis is one greater than the number of days; hence the sidereal day cannot be used for daily life and the solar day must take its place.

The true or apparent solar day is the interval between two transits of the sun over the meridian. Owing to the varying velocity of the earth in its orbit and to the obliquity of the ecliptic, the difference between a transit of the sun and that of a star will sometimes change by more than four minutes and sometimes by less than four minutes in a day. Thus the solar days are a little longer at some seasons and a little shorter at others. A hundred years ago, when men depended mainly on observations of the sun, or on a sundial or a meridian mark, for their time, the difference caused no trouble, but when accurate clocks and watches were introduced they had to be constantly set forward or back in order to keep time with the sun.

Apparent solar time is time measured by the actual passage of the sun over the meridian. Mean solar time is defined by the motion of a fictitious sun called "the mean sun," which is imagined to move with perfect uniformity, being sometimes behind the true sun and sometimes in advance of it. The hours of this time are those measured by a perfectly regulated clock. On the system of measuring the day by the sun, noon at any place is the moment at which the mean sun passes the meridian of that place. Owing to the roundness of the earth different places pass under the sun at different times; in fact, noon continually travels around the earth, reaching every part of it in succession during intervals of one day. Noon takes about three hours to pass from New York to San Francisco. When it is noon at San Francisco it is one o'clock in the Rocky Mountains, two o'clock in the Mississippi valley, three o'clock in the Atlantic coast, four o'clock in Labrador, eight o'clock at Greenwich, etc. The difference is four minutes for every degree of longitude. So long as men did not travel rapidly this difference of time caused no inconvenience; but when railways were introduced it caused confusion. To lessen this confusion, what is called standard time was introduced in 1883.

The rule for standard time is that, within the belt included between the meridians of Calais, Me., and Newark, Ohio, railways and the public shall use the time (called Eastern time) determined by the observer E. of Philadelphia, who is exactly 75° in longitude, or five hours in time W. of Greenwich. Going farther W., say to Cincinnati, a new meridian of 90° W. of Greenwich is taken, which passes near New Orleans, St. Louis, and Davenport. The mean sun crosses this meridian one hour after it crosses that at Philadelphia, and the moment of crossing is taken as noon, not only for all places on the meridian, but for all places within half an hour E. of W. of it; this time is called Central. At Denver the St. Louis noon gun would be heard at eleven o'clock. So we pass a new meridian near Denver, which is 105° W. of Greenwich, and which the sun does not reach until two hours after it has passed Philadelphia. and one hour after it has passed St. Louis. The time of this meridian (called Mountain time) is used for all the places whose time does not differ from it by more than half an hour. A fourth meridian is that of 120° from Greenwich, and it passes near the Pacific coast, E. of Sacramento and Stockton, where the time is called Pacific time. The moment when the sun crosses this meridian is taken for noon for all places not more than half an hour distant from it E. or W. Thus the traveler who wishes to know the time actually used at any railway station, or by the inhabitants of any city, has only to change his watch by one or more entire hours, the minutes remaining the same. See CHRONOLOGY.

Timo'leon, abt. 395–337 B.C.; Corinthian general, liberator of Syracuse. In his hatred of tyranny he assassinated his brother Timophanes, who had usurped power in Corinth. Seized by remorse, he lived for nearly twenty years in seclusion. In 344 he took command of an expedition sent by the Corinthians in aid of the Syracusans, attacked by the Carthaginians and Hicetas of Leontini. Dionysus the Younger, despairing of success in his own cause, gave up to him the island of Ortygia, and Syracuse easily fell into his hands. He gave the inhabitants a democratic constitution, and in a short time more than 60,000 immigrants and exiles repeopled the deserted town. In 339 the Carthaginians landed at Lilybæum an army of 80,000 men, but Timoleon defeated them, and afterwards continued to dethrone tyrants until none was left throughout Grecian Sicily. He declined the supreme power, and withdrew from public life.

Ti'mon (called THE MISANTHROPE), an Athenian of the fifth century B.C. In consequence of disappointments in friends, he secluded himself, and admitted no one to his society except Alcibiades. He is the subject of Shakespeare's "Timon of Athens."

Timor (tĕ-mŏr'), an island of Malaysia, the largest of the chain which stretches eastward from Java; area, 12,350 sq. m.; pop. abt. 400,000. It is traversed from E. to W. by a range of lofty volcanic mountains; earthquakes are frequent. Along the shore the districts are fertile and densely peopled, and in these rice, sugar, indigo, papaw, sago, pineapples, and cocoanuts are cultivated. Buffaloes, oxen, pigs, and fowls are plentiful; turtles, pearl oysters, and coral are found along the shores; gold dust and timber are exported. The inhabitants are partly Malayans, partly Oceanian Negroes, and as the population belongs to two different races, in the same manner the fauna and flora of the island belong to two continents, to Asia and to Australia. The Dutch have a residency, Kupang, in the SW. part of the island; the Portuguese, a district, with the chief town, Deli, in the NE.

Timor Laut (lowt), or **Tenim'ber Is'lands,** a group belonging to the Malayan Archipelago, and lying E. of Timor. Their area is estimated at 2,060 sq. m.; pop. (1895) 24,858. The larger ones, Timor Laut and Larat, are volcanic; the smaller of coral formation. Birds are numerous and brilliant, especially cockatoos.

Tim'othy, disciple and companion of St. Paul; b. at Lystra or Derbe in Lycaonia, Asia Minor, abt. 20 A.D., the offspring of a Greek father and a Jewess; was trained in the Jewish Scriptures by his mother Eunice and his grandmother Lois, who were Christians, but was not circumcised until Paul selected him as a companion. He became the most constant and devoted of Paul's fellow workers; was employed as "the messenger of the churches," as the apostle's "other self," in the execution of the most responsible spiritual commissions, and was doubtless his amanuensis in the preparation of most of the epistles, his name being associated with Paul's, in a manner to suggest joint authorship. Whether he shared in the voyage to Italy is uncertain, but he afterwards appears at the side of Paul while a prisoner in Rome, and finally as overseer of the important church at Ephesus, where Paul addressed him two canonical epistles. His later history is unknown, as the tradition of his martyrdom under Domitian rests upon no evidence.

Timothy, or **Herd's'-grass,** the *Phleum pratense,* one of the best of forage grasses, a native of Europe, and much cultivated there and in the U. S. The name timothy is from Timothy Hanson, who carried the seed to the S. colonies of N. America abt. 1720. In Pennsylvania, etc., the red top, *Agrostis vulgaris,* is called herd's-grass. Timothy will not stand close pasturage, but affords fine crops of the best of hay.

TIMOTHY; ALSO CALLED HERD'S-GRASS.

Timothy, First and Sec'ond Epis'tles to, epistles addressed by St. Paul to Timothy, the former in 64, the latter in 65 or 66, both from Rome. They are chiefly occupied with instruction in the duties of a spiritual teacher, mingled with admonitions of a personal nature and references to Timothy's personal history; and the second epistle is endowed with a peculiar interest from its references to Paul's anticipated martyrdom, being probably the last extant production of his pen. With the similar letter to Titus they constitute the so-called Pastoral Epistles.

Timur', or **Tamerlane'** (the latter name being a corruption of TIMUR LENK—that is, Timur the Lame), abt. 1336–1405; Mongol conqueror; b. at Kesh, near Samarcand, the son of a chief of a Mongol tribe and a descendant of Genghis Khan. In 1369 he became chief of his tribe, and from his capital, Samarcand, established a firm and orderly government. He then set out on his career of conquest, which resulted in the subjugation of the whole of central and W. Asia, from the Chinese wall to the Mediterranean and from the Siberian steppes to the mouth of the Ganges. In 1393 he stood on the banks of the Dnieper threatening Moscow, but he turned to the S., burned Azov, and retreated into Asia. In 1398 he conquered N. Hindustan, whence he sent an immense amount of booty to Samarcand, and meditated pushing onward to the S., when he was called by the Eastern emperor and some of the princes of Asia Minor to aid in repelling the Turks led by Bayazid (or Bajazet). On July 20, 1402, the two huge armies, led by Bajazet and Timur, met on the plain of Angora, and the Turks were routed; Bajazet himself was taken prisoner. In 1404 Timur prepared for a grand expedition to China, and in 1405 crossed the Jaxartes at the head of a large army of veteran troops, but died at Otrar, and his empire soon became dismembered. His cruelty and that of his soldiers was beyond description. Thousands of his captives were put to death, and he is said on one occasion to have had an enormous pyramid built of the skulls of his slaughtered foes. As an administrator, however, he seems to have shown moderation as well as statesmanlike foresight and ability.

Tin, a lustrous, white metal, not easily affected even by moist air at low temperature; soft, malleable, of low tenacity, quite ductile at 212° F. (100° C.), a moderately good conductor of heat and electricity. It may be beaten into thin sheets known as tin foil. It is one of the oldest of known metals, being mentioned in the Pentateuch, and obtained by the Phœnicians from the British Isles, hence called Cassiterides (from *κασσίτερος*, tin). Pliny's *stannum* was an alloy of silver and lead, perhaps also tin, which he called *plumbum album*, white lead. The most important ore is the oxide, called cassiterite, tinstone, and tin ore; it occurs in veins, when it is called mine tin, and also as rolled pebbles in alluvial deposits, furnishing excellent ore, known as stream tin and wood tin. It is generally a dark-brown mineral, crystalline, and very hard; generally has a high, vitreous luster, and contains 78.67 per cent of tin. A far less abundant and less valuable ore is stannite or tin pyrites, a sulphide of tin, copper, iron, and zinc. Native metallic tin has probably never been found. A little tin has been detected in meteoric iron. Over one half the tin supply of the world comes from the Straits Settlements. Large deposits are found in Perak, the island of Banca, and nearly all the Australian colonies. Bolivia also exports some tin. The U. S. is dependent upon imports for its supply of tin. The most important alloys of tin are britannia metal, 75 to 94 parts of tin, 5 to 10 of antimony, and 2 to 8 of bismuth: pewter, 4 of tin and 1 of lead; queen's metal, 9 of tin and 1 each of antimony, bismuth, and lead; fine solder, 2 of tin and 1 of lead; common solder, equal parts of each; coarse solder, 2 of lead and 1 of tin; speculum metal, 1 of tin and 2 of copper (but variable) with sometimes a little arsenic; bell metal, 78 of copper and 22 of tin, with sometimes a little zinc and lead; bronze, with less tin than bell metal, and with 3 to 4 of zinc; gun metal, best with 9 of copper and 1 of tin; sheathing for ships, 32 of copper and 1 of tin; fusible metal, with 1 of lead, 2 of bismuth, and 1 of tin (fuses at 200.7° F.); amalgam of tin and mercury for coating mirrors; and Babbitt metal; type metal, also, for fine work, contains a little tin. Melted tin is used to coat sheet iron (tin plate) and copper; copper, zinc, brass, and iron can also be tinned in the wet way; and tin has been successfully deposited on textile fabrics. Phosphor tin is largely used for the manufacture of phosphor bronze. Various salts of tin are used as mordants in dyeing. Tin plate is made by coating sheet steel with tin.

Tin'der, a material, usually composed of half-burned linen, formerly used in kindling fires. A flint and steel ignited the tinder, which inflamed in turn a sulphur match. Amadou, touchwood and touch-paper were substitutes for tinder.

Tinoc'eras. See DINOCERAS.

Tintoret'to. See ROBUSTI, JACOPO.

Tippecanoe (tĭp-ė-kă-nô') **Riv'er**, a river of Indiana, rising in Tippecanoe Lake, Kosciusko Co. It pursues a devious SW. course for 200 m. and falls into the Wabash. On the banks of this river, at the present village of Battle Ground, Gen. Harrison fought and defeated the Indian tribes commanded by "the Prophet," the brother of Tecumseh, November 7, 1811. In the middle of the night, when the whole force, consisting of 300 regular troops and 500 militiamen, was asleep, the Indians suddenly attacked the camp. A desperate fight ensued, the Indians several times advancing and retreating; but after daylight they were finally defeated and dispersed. They left forty of their dead on the field; Harrison's loss was sixty killed and twice as many wounded. On the following day "the Prophet's" city was visited; it was found deserted, and was burned. Harrison, nevertheless, considered it prudent to effect a speedy retreat, on account of the great number of wounded with which he was incumbered, and he fell back upon Vincennes. This battle led to a general outbreak of the Indians in the NW. in the War of 1812. It gave Harrison such prestige that in the election of 1840 the slogan was "Tippecanoe and Tyler too."

Tippoo' Sa'hib, 1749-99; Sultan of Mysore; a son of Hyder Ali; was instructed in European tactics by French officers, and distinguished himself in the war against the British, defeating them at Perimbakum and on the banks of the Kolerun. On December 7, 1782, Hyder Ali died, and Tippoo Sahib then prepared for energetic prosecution of the war. He took Bednore and Mangalore, but in the meantime peace had been concluded between Great Britain and France, so that Tippoo Sahib was compelled also to conclude peace, but on advantageous conditions. He continued to intrigue against the British, and in 1790 the war was renewed. In spite of his brilliant tactics in laying waste the Carnatic almost to the gates of Madras, and thereby for a time baffling his enemies, he was finally defeated, and was compelled in 1792 to sue for peace by ceding half of his dominions and paying 3,030 lakhs of rupees. However, he still intrigued with the French, and when Napoleon landed in Egypt the British East India Company determined to crush its enemy before it might become too late. In 1799 the company declared war against Mysore, invaded the realm with two armies, and shut up the sultan in his capital, Seringapatam. Here he fell May 4, 1799, while fighting on the walls; his dominions were confiscated and the spoils from his palace were carried to London. During the last years of his reign, after 1792, his government was of a very oppressive character, but he was popular among his subjects, and after his death he was considered a martyr to the faith of Islam.

Tire'sias, a celebrated soothsayer in Thebes. He was blind, but understood the language of the birds, and lived to a great age. Even after his death he did not lose his power of prophecy. He had a famous oracle near Orchomenus, but after a plague it became silent. Greek mythology tells many stories of the origin of his blindness and soothsaying power.

Tiryns (tī'rĭnz), in Argolis; one of the most ancient cities of Greece. Its inhabitants appeared in history for the last time at the battle of Platæa, but shortly thereafter the city was destroyed by the Argives, though its cyclopean walls, over 20 ft. thick, still exist.

Tisch'endorf, Lobegott Friedrich Konstantin, 1815–74; German biblical scholar; b. Lengenfeld, Saxony; studied theology and philology at Leipzig, 1834–38; Prof. of Theology there, 1845. From an early period of his life he concentrated his study on a critical revision of the text of the New Testament; made extensive journeys in Europe examining the materials for such a revision, and visited Egypt, the Sinaitic Peninsula, Syria, and Palestine in 1844, 1853, and 1859. From the monastery of Sinai he brought back the famous "Codex Sinaiticus," the oldest Greek manuscript of the Bible, now preserved in St. Petersburg. See Codex.

Tissot (tĕ'sō), **James,** 1836–1902; French painter; b. Nantes, France; pupil of Lamothe and Flandrin; medal, Salon, 1866; first-class medal, Paris Exposition, 1889. He lived for years in London, and did not exhibit in the Salon after 1870. He reappeared, however, at the Salon of the Champ de Mars in 1894 with a series of pictures representing the life of Christ. One of his earlier works, "The Meeting of Faust and Marguerite," is in the Luxembourg Gallery, Paris.

Tis'sues. See Histology.

Tita'nium, element discovered by Dr. William McGregor in menaccanite from Menachan, in Cornwall, in 1791. It is found in many minerals, as rutile, iserine, etc., and is quite abundant. It is obtained by heating the double fluoride of titanium and potassium with sodium. It is a dark green, heavy powder, which cannot be burnished and is infusible. The chief practical interest that attaches to titanium is in consequence of its frequent occurrence as a constituent of iron ores, chiefly of magnetite, which passes into ilmenite or menaccanite, the two apparently occurring mixed in all proportions, and called titaniferous iron ore. Such ores are liable to be very pure—that is, free from sulphides and phosphates—but the titanium is difficult to flux out from the mass.

Tī'tans, in Greek mythology, the children of Uranus (heaven) and Gæa (earth), numbering, according to the most common record, twelve—six male, Oceanus, Cœus, Crius, Hyperion, Iapetus, and Cronus; and six female, Theia, Rhea, Tethys, Phœbe, Mnemosyne, and Themis. Uranus feared his own children and shut them up in Tartarus, but by the aid of Gæa they broke out of the prison, overthrew their father, and placed Cronus on the throne. The curse, however, which Uranus let fall on his children was fulfilled. Cronus was dethroned by his own son, Zeus, and the Titans were once more imprisoned in Tartarus, where the Cyclopes and Hundred-handed were set to watch them. Among their descendants were Atlas, Prometheus, Helios, Hecate, and Selene.

Tithe (tīth), literally "tenth," a tax, consisting of one tenth of the annual profit of land, stock, or labor which, instituted by Moses, was paid by the Jews for the maintenance of the Levites and in compensation for their service in the Temple (Lev. xxvii, 30–33; Num. xviii, 21–24). Of this tithe the Levites paid a tenth to the priests (Num. xviii, 26, 28). Deuteronomy xiv, 22–29, enjoins the payment of a second tithe, which was either to be eaten before the Lord, if it were in produce, or turned into money and the money spent for food to be eaten at the central sanctuary. Every third year there was apparently a third tithe in kind, which was to be eaten by all comers to the feast. Tithes were known also to Roman law, but are no part of New Testament legislation. In the Christian Church they were first enjoined about 350 as due for the support of the clergy, recommended by the second Council of Tours, 567, and first decreed by the Second Council of Macon, 585. They were not firmly established, however, in Germany, France, and England until the ninth century. Even before the period of the Reformation tithes became subjects of bargains, of buying and selling, like other property. Originally they were paid in kind, but in the eighteenth century money was generally substituted. In France they were abolished by the revolution. In England tithes were collected from early times in support of the Church. Such tithes up to the value of 40 s. must be paid.

Titho'nus, in Greek mythology, son of Laomedon and Stryms and brother of Priam. **Eos,** who loved him, obtained for him the gift of immortality, but forgot to ask the gods for his continued youth, so he withered into old age. Hence an old man was often called Tithonus. He prayed to be relieved of his burden of senility, whereupon Eos changed him into a katydid or cicada.

Titian (tĭsh'ăn), or **Tiziano Vecellio** (tēt-sē-ä'nō vā-chĕl'lē-ō), 1477–1576; Italian painter; b. Pieve di Cadore, Italy. At the age of ten he was sent to Venice where he studied art with Sebastiano Zuccato; he worked with Gentile and Giovanni Bellini, then under Giorgione. In 1507 Giorgione and Titian painted together at the Fondaco de Tedeschi. Titian was invited to Padua, where he executed three frescoes in the Scuola del Santo in 1511. At the death of Giovanni Bellini, Titian received the order to continue the work in the hall of the Grand Council of the ducal palace at Venice, and the Senate showed their satisfaction with the work done by conferring on him an office which brought 120 crowns a year and the obligation of painting for eight crowns the portrait of every doge created during his lifetime. In 1517, at the call of Alfonso d'Este, Titian went to Ferrara and executed several great works, among them the "Bacchus and Ariadne," "The Sacrifice to the Goddess of Festivity" and "The Bacchanal." Titian was employed by princely clients until 1523. He was then recalled to Venice to paint the doge Gritti, and his fresco above a staircase of the ducal palace of "St. Christopher Carrying the Christ Child" is of this period, and an example of his power in this branch of painting. In 1530 Titian was called to Bologna to paint a portrait of Charles V. In 1532, at Bologna, he painted a second portrait of the emperor, and was rewarded by the order of the Golden Spur, which brought with it the title of Count Palatine of the Lateran. Ten years later Titian was again called to Bologna to paint a portrait of Pope Paul II. In 1545 he was in Rome, where he produced one of his most famous portrait pieces, representing the pope and his relatives. In 1547 Titian was summoned to Augsburg by the emperor, who employed him to paint the portraits of the great or noble men around him. Titian was in great favor with the emperor, and after two years of court life he returned to Venice much the richer, but always greedy of wealth, even showing himself servile in his anxiety to obtain it. Philip II, King of Spain, showed himself as great a patron and friend of Titian as his father. Titian lived luxuriously, and received all the princes and learned and famous men of his time. He had the most pleasant and courteous manners. He is the only painter who worked for a period of ninety years. He was carried off by the plague.

Titicaca (tĭt-ē-kä′kä), the largest inland lake of S. America; on the confines of Bolivia and Peru, 12,545 ft. above sea level. Area, 3,200 sq. m. The Titicaca, often called the Bolivian plateau, is the most remarkable of the high inclosed basins of the Andes. It is 600 m. long and 150 m. wide. The lake is now navigated by small steamers, brought in parts over the mountains. The islands and shores of the lake contain many ruins, some of the Incan period, others older and of a higher civilization. Copacabana, near the S. end, was the sacred place of the Incas, and now celebrated for a chapel with a miraculous painting of the Virgin. The Desaguadero issues from the S. end of the lake.

Tit'lark, or Pip'it, any bird of the genus *Anthus* and group or subfamily *Anthinæ*. The titlarks are generally contrasted with the wagtails by the comparative shortness of the tail (shorter than the wings), which has the two central feathers shorter than the lateral, and all broadest near their ends, and boldly round at the extremities. They are mostly grayish brown, and in the under parts variously streaked. Over fifty species are known, and almost every land has representatives of the group. They are birds of passage, insectivorous and graminivorous, rather fine songsters, and graceful in appearance and movements. Three species are found in the U. S., namely: the American titlark or pipit, the Missouri skylark, and *A. cervinus*. The European titlark sometimes straggles into Greenland and Alaska.

Ti'tle, in law, a word often used as synonymous with property, or right of ownership, but in its technical sense denoting the sources of such right, or the facts and events whereby property in land or goods is acquired. The common law divides all titles to real property into two classes—*by descent* and *by purchase*. Title by descent includes the single mode of acquisition through inheritance; title by purchase embraces all other methods. Property may be acquired by (*a*) *original acquisition* (accretion, finding, etc.); (*b*) *lapse of time* (prescription and limitation); (*c*) *eminent domain*, or the taking of land by or under the authority of the state; and (*d*) *conveyance* (including gift as well as sale), which may be effected in various forms, but is now, in the case of real property, usually accomplished by deed, known as a grant, and, in case of personal property, by delivery or writing. In case (*a*) it is assumed that there was no previous ownership of the property; in cases (*b*) and (*c*) the acquired title has no reference to such previous ownership as may have existed; while (*d*) presents the ordinary case of the transfer of the right of property from one to another. The death of an owner operates to transfer property by (*a*) *descent*, (*b*) *occupancy*, (*c*) *gift causa mortis*, and (*d*) *wills*.

Hanging Tit.

Tit'mouse, Tit, or Tom'tit, any bird of several species of the *Paridæ*. They are small, with soft and lax plumage, a stout conical bill shorter than the head, the wings rounded and short, and the sides of the toes expanded into a palm. The group belongs chiefly to the N. hemisphere, and more to the Old World than to the New; N. America possesses but thirty species out of nearly a hundred. They are mostly birds of dull plumage, although there are exceptions, like the blue tit of Europe, which is blue and yellow. *Parus wollweberi*, the species found in the W. parts of the U. S., and its E. relative, *P. bicolor*, are crested. The Cape titmouse is found at the Cape of Good Hope. One of the most familiar species is the chickadee, which, like most of the group, is a hardy bird. Titmice feed on insects and seeds; some nest in holes of trees, others make curious, and for the size of the bird large, bottle-shaped structures; the eggs are numerous, eight or nine, and two broods are frequently raised in a season.

Ti'tus, a disciple and companion of St. Paul, to whom one of the canonical epistles of the New Testament is addressed. He was a Gentile, his native place being probably Antioch, for he appears as a delegate from the church of that city, accompanying Paul to Jerusalem. He was a companion of the apostle in his next missionary journey to Asia Minor and Macedonia, and was twice charged with important missions to the church at Corinth. Titus took part with Paul in founding the churches in Crete, where he was laboring as an evangelist when Paul's pastoral epistle was written. He appears to have rejoined Paul at Nicopolis in Epirus, and was thence sent into Dalmatia, from which time all certain traces of him disappear. Tradition makes him Bishop of Crete.

Titus, Arch of. See Arch.

Titus, Epis'tle to, one of the so-called pastoral epistles of the New Testament canon, written by Paul to convey instruction as to the work in Crete, with the execution of which Titus had been commissioned. If the hypothesis of Paul's second imprisonment be true, this epistle and the first to Timothy were written during Paul's journey to Asia Minor and Greece, before his last imprisonment. The epistle, it is thought, was written from Nicopolis, probably the Epirote town of that name, and not the Macedonian city.

Titus Fla'vius Sabi'nus Vespasia'nus (commonly called Titus), 40–81 A.D.; Roman emperor (79–81); son of Vespasian and Flavia Domitilla. Titus was educated with Britannicus, the son of Claudius, with whom he formed an intimate friendship. He served under Vespasian in the Jewish War, and on Vespasian's return to Rome as emperor in 69, Titus was left as commander in chief, and finished the war by taking and destroying Jerusalem, September 8, 70. After his accession to the throne (June 24, 79) Titus disappointed the general expectation by ruling justly and humanely. The *delatores* (informers) were punished, and prosecutions for treason came to an end. Many splendid public buildings, the Colosseum, the baths, etc., were finished; and the emperor showed a generous disposition to help the people under the calamities which befell them during his reign—the destruction of Herculaneum, Pompeii, and Stabiæ by the eruption of Vesuvius, the conflagration in Rome in the following year, by which the Capitol, the library of Augustus, and many of the most magnificent edifices of the city were destroyed, and, finally, the plague. Titus was succeeded by his brother Domitian.

Titus Liv'ius. See Livy.

Tivoli (tē'vō-lē), ancient *Tibur*, town; 19 m. ENE. of Rome, Italy; in a bend of the Anio, an affluent of the Tiber. It is a busy town, and manufactures woolens, thread, and wire. Tivoli was founded about five hundred years before Rome, and is equally noted for its natural beauties and for its ruins and antiquities. It has long been a favorite pleasure resort for the Romans, and with it are associated the names of Mæcenas, Horace, Propertius, Catullus, Hadrian, and Zenobia. Among the objects of interest are the Temple of the Sibyl, the falls of the Anio, and the constructions to protect the city from the river, the ruins of the villa of Varus, of the so-called villa of Mæcenas, now believed to be the temple of Hercules the Conqueror, that of Hadrian, and that of Este. Pop. (1901) 13,396.

Toad, any one of the *Salientia*, or tailless batrachians, having a short body and legs and a warty skin. There are no ribs nor teeth, and the tongue is free behind. The young, like frogs, pass through a tadpole stage. Toads are found in all parts of the globe (save, of course, the colder portions) except the Australian region. They live upon insects, grubs, etc., which they catch in large numbers with their peculiarly arranged tongue, which can be rapidly protruded and withdrawn, and are of service to gardeners. They either burrow in the earth at the approach of winter, and there hibernate, or pass the cold season in holes. There is no foundation for the stories that toads are found imbedded in solid rock, or in the trunks of trees, nor are toads poisonous except to the extent that their skin secretes an acrid fluid, which is extremely unpleasant to carnivorous mammals, and is thus protective. The common toad of Europe (*Bufo vulgaris*) is found also in Asia and NW. Africa. It is about the same size as the common toad of the U. S. (*B. lentiginosus*). See Batrachia.

Toad Spit. See Frog Spittle.

Toad'stools, a popular name for the plants of the order *Hymenomyceteæ* of the higher fungi. They are otherwise known as Mushrooms (*q.v.*). See also Fungi.

Tobac'co, a plant of the genus *Nicotiana* of the *Solanaceæ*, first brought to the knowledge of civilized nations on the discovery of America, where it was found in use by the natives as far N. as Virginia. Comparatively little notice was taken of this plant until abt. 1650, when it entered largely into the trade of the American colonies with Europe. Although the genus contains some species that are shrubby, the cultivated plant is everywhere an annual; the best-known species, *N. tabacum*, is an upright plant, having a single stalk from 3 to 6 ft. high. The leaves are broad near the ground, and enlarge to 3 ft. in length and 1 ft. wide in some varieties, but diminish in size as the stalk rises. The latter is surmounted by funnel-formed flowers, usually with a long tube, bearing purple or light-red petals. The seeds are minute, brown or black, and numerous. The only other species that is much grown is *N. rustica*, a much smaller plant, with greenish flowers and adapted to a cool climate. The purpose to which tobacco is applied is almost wholly as a tonic, stimulant, or sedative through smoking, chewing, or snuffing. It cannot be taken into the stomach without injurious results, and is essentially poisonous in its general properties. The distinctive properties are found only in the leaf, which is thick and heavy, becoming oily as it ripens. This leaf, when the plant approaches maturity, is dried and cured by partial sweating, which effects a chemical change, removing the characteristics of the fresh leaves, and developing a powerful aroma, with strong narcotic and acrid properties.

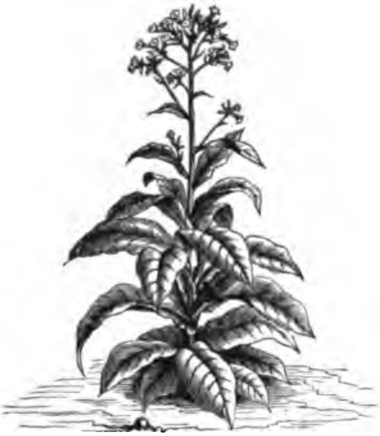


FIG. 1.—TOBACCO PLANT.

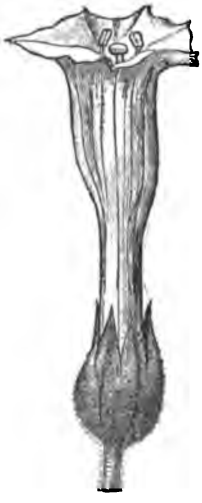


FIG. 2.—COMPLETE FLOWER.

The production of tobacco is greater in the U. S. than in any other country, and it may be fairly estimated to furnish over one third of the world's supply. The amount of tobacco produced in the U. S. in 1859 was 434,209,461 lb.; in 1869, 262,735,341 lb.; in 1889, 488,255,896 lb. In 1909 it was 949,357,000 lb., valued at $95,719,000.

Its cultivation is possible in a range almost as great as that of Indian corn, but it is destroyed by frost, and the risk in the N. states is great. The largest producing countries other than the U. S. are tropical or semitropical. Cuba may be estimated to produce 60,000,000 lb. a year, chiefly in the district of Vuelta del Abajo, a rich plain SW. of Havana. A government monopoly long existed in Cuba, but the production and trade were thrown open in 1820. The finest leaf is grown in Cuba for the manufacture of cigars both there and in the U. S. and Europe. Porto Rico produces tobacco in considerable quantity, but not of so good a quality as that of Cuba. Haiti produces more than Porto Rico, chiefly in its NE. part. Mexico produces largely. The Central American states produce and export not more than Mexico. New Granada and Venezuela produce and export largely, furnishing 20,000,000 lb. to general commerce, and consuming freely. Peru furnishes a small quantity. Brazil has greatly enlarged its production, and, with Uruguay and the Argentine Confederations, contributes largely to the European supply—perhaps 20,000,000 lb. British India produces inferior tobacco. The Philippines produce 2,000,000 lb. for export. Java furnishes 20,000 piculs (2,670,000 lb.) for annual export, and China and Japan together as much more, which is brought to Europe. Turkey produces a fine tobacco, the best being sent from Latakia, in Syria.

The value of the tobacco being wholly in the leaves, great care is taken to increase their size and concentrate the strength of the plant upon them. Thin, glossy leaves of silky texture are most prized for cigar wrappers. The seed is everywhere sown in beds, and the young plants transplanted to the tobacco fields when 2 to 5 in. high. In the preparation of the seed bed care is taken to have the soil dry, warm, well supplied with plant food, and protected from chilling winds. The plants are set in rows 2 to 4 ft. apart, that admit of cultivation with a horse. As the tobacco plant grows rapidly when once established, it is essential to give thorough cultivation as well as an abundance of plant food. The flower stem is broken out or topped, and the strength of the plant concentrated on ten to sixteen of the larger leaves. Shoots or suckers grow quickly from the axils of the leaves after topping, and these shoots must be removed. About four months is the period of growth.

The process of harvesting is to cut the whole stem near the ground, allow the plants to wilt somewhat, and draw them to the shed or tobacco house, where they are hung on poles to cure. Sometimes the leaves are removed from the stalk as fast as they ripen, and they are cured by artificial heat. After the plants are dried they may be taken down, and the leaves stripped from the stalks whenever the weather is damp. The leaves are tied into bundles, carried into the sorting house and sorted, according to kind and quality. The leaves, after sorting, are tied into little bundles called hands; these hands are then packed tightly into the hogsheads for the market. Care is used in handling the tobacco during the sorting process to expose the tobacco only in a damp atmosphere, in order to keep the leaves soft and pliable. After the tobacco is packed it is allowed to pass through a process of curing called sweating before it is used to make chewing or smoking tobacco.

Manufactured tobacco is technically distinguished from both the cured leaf and from cigars or snuff. It is made from ordinary or inferior leaf by twisting, pressing, or cutting, and assumes various forms and names. Sirups and licorice are largely used in its preparation, though adulteration with other leaves or deleterious substances rarely occurs. In Great Britain adulteration is carried to extremes. Great improvements have taken place in preparing tobacco for chewing and smoking. Cavendish, navy, twist, negro-head, etc., are standard names or brands in the trade for that which is compressed in solid forms; "fine cut" is shredded and loose in fibrous masses, cut by delicate machinery from leaf of good quality and flavor. Smoking tobacco is prepared of every grade and quality, but usually from broken leaves, stems, and inferior parts. In the U. S. less of such grades, or of smoking tobacco generally, is made or consumed than in Europe. Cigars constitute the most important form in which tobacco is consumed and the largest aggregate in general consumption, and their greater value induces every effort to produce leaves suited to covering cigars by the growers. The cigar is of Spanish or Spanish colonial origin, and it was long in use in Spain before its general adoption by other nations. The greatest skill in making cigars has always been shown by Spanish or Cuban artificers, and Havana has been the seat of the best manufacture for a century or more. The materials used for filling must be good and must be combined so as to secure firmness with a good draught. The wrappers must be of elastic and moistened leaf, so applied as to form a perfect ovoid cylinder, one end of which is closed and the other open. Uniformity in size, length, weight, and color is essential. Cigars are tied in bundles of twenty-five to fifty each, and these are packed in boxes of Spanish cedar, usually 100 in a box. The Spanish cedar is exported to the U. S. for making boxes, and is also imitated in American cedar, but the general form of tying and packing is tenaciously adhered to. Nearly one half in value of all tobacco grown is made up into cigars.

Cigarettes are small rolls of fine smoking tobacco inclosed in paper wrappers; they are largely made in Cuba and in the U. S. They are ranked and counted as cigars for revenue purposes. Snuff has been made from a very early period, first and most largely by the Spanish, who scented it with various materials. Next the Netherlands, Scotland, and England extended its use. For many years Scotch snuff has been the favorite, and large manufactures have existed in Great Britain, with a moderate production in the U. S.

Chemistry and Physiological Relations of Tobacco.—The most important ingredient of the tobacco leaf is the alkaloid nicotine, which is present, in the dried leaf, in quantities varying from two to six per cent. Pure nicotine is colorless, oily liquid of a strong alkaline reaction, disagreeable smell, and hot, acrid taste. On exposure to light it turns to a reddish-brown color. It is a virulent poison, a single drop sufficing to kill a rabbit in less than four minutes.

In man, tobacco taken in sufficient quantity to show poisonous effects produces giddiness, faintness, and an indescribable feeling of sinking and misery, followed shortly by intense nausea, severe and continued vomiting, and relaxation and feebleness of the muscular system. The skin becomes pale and moist and the pulse feeble. More or less of these effects may persist for a day and more after the poisoning. They are familiarly seen in young lads when first beginning to smoke.

The popular question whether good or harm follows the habitual use of tobacco is too broad to admit of a single sweeping answer. In the first place tobacco is not a general necessity for the human race; for individuals, whole classes, and even entire races of men, have attained a very high physical and mental development without the use of the agent. Then, to young persons, under twenty-five years or so, tobacco, even in small quantity, is so apt to disorder health that for such it should be considered generally harmful. Many persons, even adults, can never indulge at all in tobacco without being to some degree poisoned. For such individuals the weed is to be regarded as noxious. An enormous number of persons can and do use tobacco (the actual quantity consumed varying with the individual) not only without apparent present disturbance of health, but with maintenance of as full physical and intellectual vigor, freedom from sickness, and longevity as are found with nonconsumers. To say that such individuals, did they abstain, would be still more hearty or long lived is to assert that which obviously can be neither proved nor disproved. Finally, the exigencies of our artificial civilization often demand a continued overtaxing of either the physical, intellectual, or emotional faculties, and in some such cases, especially where the sufferer is past the most vigorous period of life, tobacco in moderation often seems to counteract in some measure the evil effects of the strain, disposing to emotional and physical calm, removing fatigue, assisting digestion, and supplementing a scanty food supply. If, then, the abatement of morbid symptoms and restoration of the bodily functions to their normal status be beneficial, we must accord to tobacco in the present instances the right to be regarded as a useful agent. Any tobacco consumer, by reverting to the symptoms of chronic tobacco poisoning can determine whether he is crossing the "poison line."

In medicine tobacco is used solely for its relaxing influence upon the muscular system. Before the introduction of anæsthetics it was thus sometimes employed in cases of visceral spasm. In asthma some sufferers find relief from smoking tobacco, but as a rule the remedy is not of much use. Externally, lotions and ointments of tobacco have been used for various purposes, but extensive application is highly dangerous, fatal poisoning having more than once occurred in consequence.

Toba'go (originally *Tabaco* or *Tabago*), an island of the W. Indies, 20 m. NE. of Trinidad.

Length from NE. to SW., 26 m.; area, 114 sq. m. It is mountainous, except at the SW. end; portions are still covered with forest, the valleys and lower lands are well cultivated, the principal products being sugar and cacao. The island is generally regarded as one of the Caribbean group, but by its structure, fauna, and flora it is, like Trinidad, an outlying portion of the S. American continent. It was seen by Columbus in 1498, was first settled by the Dutch (1632 and 1654), passed into French possession, and in 1763 was ceded to Great Britain. Since 1889 it has been a dependency of Trinidad. Tobago is evidently the island which Defoe describes as the home of Robinson Crusoe. Pop. (1901) 18,750; this includes less than 200 whites. The capital and principal port, Scarborough, has about 1,200 inhabitants.

Tobikhar' In'dians. See SHOSHONEAN INDIANS.

To'bit, Book of, an Apocryphal book of the Old Testament, found in the Septuagint. Scholars differ as to the date when it was written, some making it as early as the fourth century B.C., and others as late as the second century A.D. It is canonical with the Roman Catholic Church and some of the Orientals.

Tobolsk', a government of Siberia, bounded W. by the Ural Mountains, and extending from the Kirgheez territory to the Arctic Ocean. Area, 535,739 sq. m. The W. and S. parts of the country are occupied by spurs of the Ural and Altai Mountains, from which the land slopes toward the Arctic Ocean in one extensive plain. The N. portion of this plain is a frozen swamp during nine months of the year; the middle portion is a forest region, inhabited by hunters and producing excellent fur; the S. portion is good agricultural land, where rye, barley, oats, and the fruits of middle Europe are raised. Iron, copper, silver, gold, and platinum abound in the Urals, and are extensively worked. Manufactures of leather, soap, and woolens and an important transit trade are carried on. Pop. (1907) 1,687,100. TOBOLSK the capital, at the confluence of the Tobol and the Irtish, is a handsome town, though most of its houses are of wood, and it has manufactures of leather, soap, and tallow, besides fishing and shipbuilding. Pop. (1900) 21,401.

Tocantins (tō-kăn-tēns'), river of Brazil, rising in S. Goyaz, flowing with a general N. course, and entering the Atlantic through the Pará, which may be regarded as its estuary. The Pará receives, through the network of channels SW. of the island of Marajo, a large volume of Amazonian water, exceeding the outflow of the Tocantins proper; hence the Tocantins is commonly called a branch of the Amazon, and commercially it belongs to the Amazon system. The lower portion is very broad and lakelike. About 200 m. above Pará navigation is interrupted by rapids: above these it is freely navigable for many hundred miles. On the W. side it receives the great river Araguay, which is also navigable for a long distance, and by its length, volume, and direction may be considered the true head. The upper Tocantins (so called above the junction of the Araguay) receives many tributaries, the most important being the Manuel Alves. Small steamers ply on the upper Tocantins and Araguay, and canoes pass the rapids to Pará; ultimately this river system must form the outlet of Goyaz and E. Matto Grosso. The banks have hardly any inhabitants except Indians; rubber and Brazil nuts are brought down to Pará. Length (from Pará), by the upper Tocantins, about 1,700 m.; by the Araguay, 1,900 m.

Tocqueville (tŏk-vēl'), **Alexis Charles Henri Clérel de,** 1805-59; French publicist; b. Verneuil, France; studied law, and in 1830 became an assistant magistrate. In 1831 he was commissioned to investigate the penitentiary systems of the U. S. In 1832, having returned from the U. S., he resigned his office, and in 1835 gave to the public the first volume of his work, "De la Démocratie en Amérique," which met with a brilliant success. De Tocqueville, though himself opposed to democracy, foretold its rapid growth in the world, and was the first to write a systematic work on the democratic government of the U. S. He became a member of the French Academy in 1841. In 1848, having been elected to the Constituent Assembly, he lent his support to the cause of order. In 1849 he was Minister of Foreign Affairs. The *coup d'état* of December 2, 1851, drove him from the public service. He published "L'ancien Régime et la Révolution" in 1856.

Todleben (tōt'lā-bĕn), **Franz Eduard Ivanovich** (Count), 1818-84; Russian military officer; served in the Caucasus against Schamyl, 1848-51, and in the Danube campaign, 1853-54. To his genius in fortifying Sebastopol is attributed its successful defense for three hundred and forty-nine days against the allies in the Crimean War. He was given no command in the field in 1877 when the Russo-Turkish War broke out, but the disasters before Plevna caused him to be intrusted with the siege, which then resulted in the surrender of the entire army to the Russians.

To'dy, any bird of the *Todidæ*; peculiar to tropical America, and resembling in form the kingfishers. They dwell in damp places, and are so dull they may easily be caught by hand. They feed on insects, and make their nests in holes in the ground.

Toe. See FOOT.

Tofa'na. See AQUA TOFANA.

To'ga, the principal outer garment of wool worn by Roman citizens. It covered the whole of the body except the right arm, and it was originally worn by both sexes until the matrons adopted the *stola.* The *toga virilis,* or manly gown, was assumed by Roman youths when they attained the age of fourteen. The variety in the color, the fineness of the wool, and the ornaments attached to it indicated the rank of the citizen; generally it was white. Under the emperors the toga went out of fashion.

To'go, Heihachiro (Count), 1847-   ; Japanese admiral, b. Satsuma; educated on the British training vessel *Worcester* and at the Royal Naval College, England, 1873-74. Distinguished in China-Japanese War, 1894, and made rear admiral. As commander in chief of the fleet in the Russo-Japanese War, 1904–5, he gained brilliant victories at Port Arthur and in the Battle of Tsu-Shima.

To'goland, German protectorate, on the Slave Coast, W. Africa. It was placed under the German flag by Dr. Nachtigal (1884), and is, so far, the most prosperous of the German possessions in Africa. Wedged in between French territory on the E. and the British Gold Coast on the W., it has about 32 m. of coast, and an area of 33,700 sq. m.; pop. abt. 1,000,000; European pop. (1908) 268. Its roads to the interior are important routes to and from the thickly populated portion of the Sudan. The commerce is chiefly a barter trade for palm oil and ivory, but the forests abound with oil palms, caoutchouc, and valuable woods. The most important coast trading towns are Little Popo, Bagida, and Lome.

To'grul Beg. See SELJUKS.

Tok, any one of the small black and white hornbills (*Bucerotidæ*) of the genus *Toccus*, distinguished by a thin, compressed beak, and only elevated into a low crest. These birds are mostly found in Africa, occurring throughout the larger portion of the wooded districts, the exceptions being *T. gingalensis* of Ceylon and *T. griseus* of Malabar. They live on fruit and insects and nest in holes of trees. The typical species, *T. erythrorhynchus*, is about 18 in. long, and has a bill of a deep-red color.

To'kyo, the modern capital of Japan; area, nearly 30 sq. m.; pop. (1908) 2,085,160. Since Iyeyasu came here in 1590 it has been the government center of Japan, and is associated with all the traditions of modern Japanese bureaucracy. Its former name was Yedo, or Jeddo (Estuary Gate); changed to Tokyo (E. Capital) when the emperor removed his court hither in 1869. Up to 1400 its site was a swampy wilderness, but during the following century a castle was built, and a village arose about it. Iyeyasu enlarged the castle, had the marsh drained, and when he became master of Japan converted Yedo into one of the most populous cities in the world by compelling the territorial nobles to spend half of the year within its bounds. The city became a congeries of fenced inclosures, within which the daimios, with their retainers, established themselves. At this period the waters of the bay approached much closer to the castle walls than they do at present, the siltings of the Sumida River having gradually formed the district known as Tsukiji, *i.e.*, made ground, where the foreign settlement is. The center of the city is the castle, the moat of which, in the form of a spiral, incloses many square miles of the city. In the troubles of the restoration in 1868, the central building of the castle, where the shoguns held their court, was burned down, and the emperor, after leaving Kioto, was obliged to make use of a daimio's residence in the vicinity as a palace. In 1889 the court removed to a new palace, in which the Japanese and Western styles of architecture are somewhat bizarrely mingled. This palace is on a less elevated but more extensive site within the inner walls of the castle.

Tokyo is loosely built, being, in fact, a collection of villages and inclosures. Many of the houses, even in the heart of the city, have small gardens attached. Lying in an exposed position on the sea edge of a large plain, Tokyo is a wind-swept city, and as the houses are mostly (formerly altogether) built of wood, disastrous fires sweep over it from time to time. In 1880, 1881, and again in 1892 whole districts were laid in ashes. The business portion of the city lies in the flat ground between the castle and the sea, and is a network of canals. The Nihon bridge over the Yedo-gawa, a tributary of the Sumida, is the busiest spot in the empire, of which it is the center for purposes of mileage measurement. The two main parks of the city—Uyeno to the N. and Shiba to the S.—are connected by a long thoroughfare, the backbone of the city. Along this route street cars and omnibuses ply; elsewhere most of the passenger traffic is in jinrikishas. At Uyeno and Shiba are two fine temples where the Tokugawa shoguns were buried alternately. Between the castle and Shiba lies the official quarter of the city, where cluster the Foreign Office, the War Office, the houses of Parliament, most of the foreign legations, the residences of the princes of the blood royal, etc. This quarter is European in its aspect. The central barracks and parade ground, formerly here, have been moved out farther W. To the N. of the castle is the educational quarter, where is situated the university with four handsome colleges and a library in brick, the grounds extending to ten acres; here also are the higher normal school and private schools. All the ground W. of the castle is undulating, frequently with steep bluffs.

The Sumida River, which skirts the city on the NE., is spanned by long bridges, one of them of iron. On the flat ground across the river there is an extensive suburb. Tokyo is a great commercial entrepôt, but Osaka still remains the commercial center of the empire. Politically and socially, however, the influence of Tokyo is paramount. The youth of the empire flock here to attend schools, where they may acquaint themselves with foreign learning; indeed, there is said to be a floating population of this kind numbering 70,000. At Tsukiji there is a naval college; the anchorage is off the extreme S. suburb of the city, at Shinagawa, only vessels of light draught being able to make use of the harbor in the river. The city is lighted with electricity, and extensive water works have been constructed, the supply being taken from the Tamagawa. A small river, the Yodogawa, flows into the mouth at the N. suburb of Koishikawa, where is situated the imperial burying ground. The crematories of the city are found on the right bank of the Sumida, E. of Uyeno.

Toledo (tō-lā'thō), one of the oldest cities of Spain, and capital of province of same name. It is built on a circle of seven hills, 2,400 ft. above sea level, and inclosed on three sides by the Tagus, toward which the town presents steep and abrupt sides, while on the fourth side it is defended by two walls—an inner wall built by the Goths in the seventh century, and an outer built by Alfonso VI, 1109—both profusely adorned with towers and gates. From 467 to 714 it was the capital of the Goths, from 714 to 1085 that of the Moors, and after 1085 it was the residence and capital of the kings of Castile. Its most remarkable edifice is the cathedral, the metropolitan church of Spain, founded in 587, and one of the most magnificent church buildings in the world, 404 ft. long, 204 ft. wide, and having its chief nave almost overloaded with sculpture. Besides the cathedral, the city contains twenty-six other churches, thirty-seven monasteries, and other architectural monuments; but its general aspect is gloomy and desolate. It contains a royal palace that was originally built by King Wamba, rebuilt by Charles V, altered by Philip II, then changed into a military academy, and burned in 1887. The splendor has become sepulchral; the place, which once contained about 200,000, had in 1900 only 23,375. The only branches of manufacture now alive are those of sword blades, confectionery, and church vestments.

Toledo (tō-lĕ'dō), city (incorporated January 7, 1837); county seat of Lucas Co., Ohio; on Maumee River near Maumee Bay, 53 m. SSW. from Detroit; area, 28½ sq. m. Toledo is the most important point on the lakes for distribution of coal, ore, and lumber. Toledo has an excellent harbor, and a straight channel 400 ft. wide, 21 ft. deep, and 9 m. long. There is a wharf frontage of 25 m. The largest steamers reach these wharves, with cargoes of iron and copper ore, lumber, salt, fish, and other merchandise. There are twenty-seven important railway lines; extensive works for the manufacture of malleable iron, and furnaces for the casting of plows, steam boilers, and car wheels. One of the largest wagon works in the U. S. is located here, besides factories for carriages and automobiles. The largest plate-glass factory in the world is at Toledo. The milling interests are led by the National Milling Company, with an output of 3,000 to 4,000 barrels daily. The grain interests employ many large elevators. Shipbuilding is extensive. There are twenty-four different lines of manufacture, with a capital of over $30,000,000, distributed among 1,157 factories, employing 18,800 persons.

Toledo has an extensive park system, consisting of 910 acres, including Walbridge Park, 64 acres, in the SE. of the city, on the bank of the river; Riverside Park, 33 acres, also extending along the river; and Ottawa Park, 280 acres, in the extreme W. part of the city, where are fine golf links. There are many hospitals, reformatories, and asylums, a soldiers' memorial building, and an armory, a U. S. Govt. building, and a state asylum for the insane. From 1890 to 1900 Toledo had the largest percentage of growth of any city of its size in the U. S. The name, "The Lady of the Lakes," by which Toledo is widely known, succeeded the title, "The Miami of the Lakes," by which it was known in its early history. The equable climate, with its superior fishing grounds, made the site a favorite resort of the Miami Indians, before its occupancy by the whites. Later it became an important trading post, but it was not until the victory of Anthony Wayne, at Fallen Timbers, in 1794, that peaceful possession by white settlers became possible. Pop. (1910) 200,000.

Toledo War, a contest as to the boundary line between the State of Ohio and the Territory of Michigan (1835–37). The disputed belt included the town of Toledo. In 1836 the legislature of Ohio organized townships in this territory, which for many years had been under the control of Michigan. The Governor of Ohio called out the militia, and Gov. Mason, of Michigan, took possession of Toledo; but Congress, June 15, 1836, admitted Michigan as a state on condition of the acceptance of the N. peninsula, which formed a natural part of the Territory of Wisconsin. This addition, subsequently bringing such great wealth of copper and iron to the state, was finally accepted as an equivalent for the disputed strip at the S., which went to Ohio and Indiana.

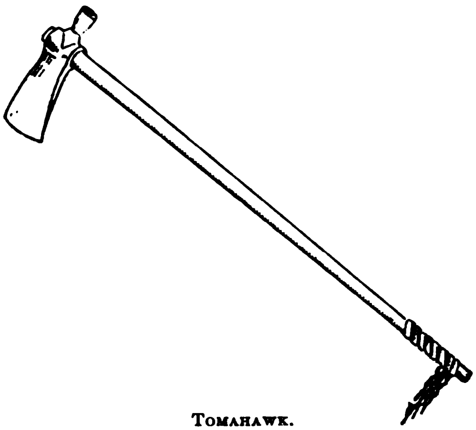
Tolstoi (tŏl'stoi), **Count Lev** (or **Lyoff**) **Alekseevich**, 1828– ; Russian novelist; b. Iasnaia Poliana, in the government of Tulu, Russia; entered the Univ. of Kazan, 1843; left without graduating after three years. Having visited the Caucasus in 1851, he joined the army, and took part in various guerrilla expeditions. After the war in the Crimea, in which he served, he gave up military life and resided for a time in St. Petersburg and Moscow; traveled twice in Europe, then in 1861 retired to his country estate, which has since been his permanent home. His works fall into three periods. To the first belong his "Childhood," "Boyhood," and "Youth"; also his "Cossacks," a description of life in the Caucasus; his "Sevastopol," and other military sketches. The second period is that of his two great novels, "War and Peace," an epic of Russian life, national and individual, at the time of the great struggle with Napoleon, and "Anna Karenina," a study of passion and its consequences. Soon afterwards Tolstoi began to give himself up to the mystical religious and philanthropic ideas which have so completely mastered him that it has been doubted whether he is to be regarded as perfectly sane.

His doctrines have been proclaimed in "My Confession," "In what my Faith Consists" (more usually known as "My Religion"), a "Commentary on the Gospel," and other works, many of them forbidden in Russia by the censors. As he believes not only in nonresistance to evil and in asceticism, but in communism, the duty of manual labor, and of everyone to live like the peasants, it is only with misgivings that he has continued to write; hence all he has done has been with a didactic or polemical aim which has often detracted from its value. Still nothing can entirely quench his genius. Many of his tales for the peasants are admirable, and in even the poorest of his productions we often find pages of splendid power. The best known of his later works are the "Death of Ivan Ilich," "The Kreutzer Sonata," and his drama, "Power of Darkness." Although the influence of his later ideas has created a sect, his reputation will probably depend on his earlier works, and especially on the two novels. Both of them, as well as the shorter productions that preceded them, display a combination of keenness of realistic insight and wealth of poetical imagination, of a wonderful breadth of view with perfect handling of minute detail seldom rivaled in all literature. The mastery of style is complete, though the author takes no pains to polish it, any more than he cares to spare us trivial incident. In "Master and Man," and in "Resurrection," he seems to have returned to his former manner and to show no diminution of power. He was excommunicated by the Russian Synod, 1901.

Tol'tecs, or **Toltec'as** (so called from their principal city, Tollan, supposed to be Tula, in Hidalgo), an Indian tribe, said to have occupied portions of the Mexican plateau during several centuries prior to the advent of the Aztecs. The little that is known of this race comes from Aztec traditions or pictographic records as they were collected by Spanish writers soon after the Conquest. They came from the N., making temporary settlements at various points, and finally fixing themselves at Tollan abt. 661 A.D. Lists of their chiefs or "kings" are extant, but these are of very doubtful value; the hero god, Quetzalcohuatl, is said to have lived in their cities before his final disappearance.

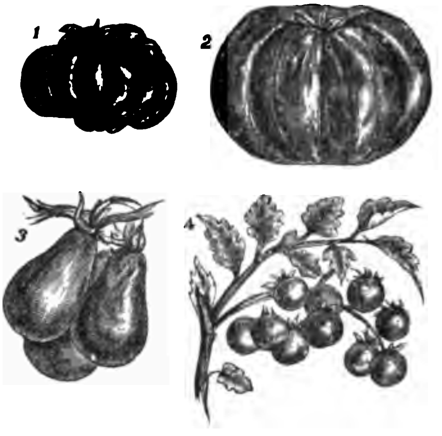
Tolu'ca, capital of the State of Mexico, in the republic of that name; 32 m. WSW. of Mexico City; 8,653 ft. above the sea. It is well built and clean, and the climate is cool and salubrious. The town has many manufactures. Pop. (1900) abt. 25,940. Nevado de Toluca, S. of the city, is an extinct volcano over 15,000 ft. high, and capped with snow. On a clear day both the Pacific and the Gulf may be distinguished from the summit.

Tom'ahawk, strictly, the war club of the N. American Indians, but the name has been given, through misapprehension, to the war hatchet, originally of stone. Europeans introduced steel tomahawks, which were sometimes so made as to serve as tobacco pipes, the handle forming the stem. The natives used them as battle-axes, and possessed great skill in throwing them so that the edge would strike first.



TOMAHAWK.

Toma'to, any plant of the genus *Lycopersicum* of the *Solanaceæ*, indigenous to the Andean region. The common tomatoes are offspring of *L. esculentum*, which was introduced into Europe in the sixteenth century. The fruit, also called tomato, formerly called love apple, was at first regarded with suspicion from its relationship to the poisonous nightshade family, and was grown for ornament, although there is a record of its having been eaten as early as 1583. This fear of the plant was not overcome until the nineteenth century, and even recently the fruit has been considered to be associated with the production of cancer. Few fruits are more healthful than the tomato, and it ranks next the potato in economic importance. A chief reason for the popularity of the plant is the excellence of the canned tomatoes. The tomato needs a warm, quick soil, and the fertilizers should be such as give much available food, in order that the plant may make the most of the early season.



VARIETIES OF THE TOMATO. 1. Common red. 2. The "Trophy." 3. Pear-shaped. 4. Currant tomato.

Tomb, a burial place of permanent character or of some pretension, especially a structure destined to contain or to cover the body of one to whom some honor is intended to be done; therefore generally a somewhat ornamental monument. Cenotaphs are also tombs, because standing for the actual tomb itself, or, in the case of persons lost at sea or the like, as being the only tomb possible. Tombs are often arranged to contain or to cover a number of burial places; thus the Roman Columbarium is the tomb of a large number of persons; the tomb of Augustus and that of Hadrian was arranged with many burial places, and modern structures set up in cemeteries are intended for the burials of a whole family. The pyramids of Egypt were tombs, and the tombs of another type, the mastabas, though less in size, were more elaborate in decoration. Grecian tombs were simple and tasteful, as became a race of such strong common sense and such gifts in art. The simple flat stone set up at a grave was often carved with all the skill that the time could afford, and these stelæ are found with inscriptions and decorative sculpture. Large edifices built as monuments to the dead are not found in Greece, but were common in semi-Greek lands of Asia. The most famous of them was that of King Mausolus of Caria. See MAUSOLEUM.

The monuments erected by the Romans are celebrated, but their form is often altered beyond recognition, even when their mass remains. The Castle of St. Angelo, in Rome, is the mausoleum of the emperor Hadrian, stripped of its sculptures, its marble colonnades, and its probably conical superstructure, and crowned with defensive works. The older mausoleum of Augustus had received the remains of the emperors who succeeded him, until its niches were filled; so Hadrian erected a still more gigantic structure for himself and his successors in office. The tombs of the Middle Ages and of the Renaissance are often of a refined beauty which no Roman work could approach. What are known as altar tombs are large, sarcophagus-like masses set on the church floor, and commonly having a life-sized effigy of the departed in bronze or stone lying upon the top.

With respect to modern structures, the term is generally used in the sense of a somewhat large interior, opening out of which are receptacles for coffins, the whole being either excavated in a hillside with a front of masonry, in which the door is above ground, like a chapel. In some cases a similar chapellike structure is erected above a single grave; but as a general thing the term is confined to family vaults. Memorial structures erected in cemeteries above or near a grave are more often called monuments; but when these are long and low, in general shape like the altar tombs of the Middle Ages, the word "tomb" is sometimes employed to describe them. In some cases a family burial place is merely excavated and built below ground, with a slab on the surface which can be raised, and to these also the word "tomb" may be applied. In short, any structure which is essentially the receptacle of dead bodies or which contains and covers such receptacles is, if built in advance, permanent, and of some pretension, a tomb, while the grave is a simple excavation, to be filled up when the coffin has been deposited. See SARCOPHAGUS.

Tombig'bee Riv'er, rises in NE. Mississippi, and after a very indirect S. by E. course of 450 m. in Mississippi and Alabama, joins the Alabama River 45 m. above Mobile, and the stream below the junction is called Mobile River. It is navigable to Aberdeen, Miss., 410 m. from Mobile Bay.

Tomp'kins, Daniel D., 1774-1825; Vice President of the U. S.; b. Scarsdale, N. Y.; graduated at Columbia College, 1795; admitted to the bar, 1796; elected to the Legislature and the State Constitutional Convention of 1801; member of Congress, 1804-5; appointed to New York Supreme Court, 1804; governor of the state, 1807-17; a conspicuous advocate of Jeffersonian principles and an opponent of the banks. He commanded the Third Military District during the War of 1812-15; chosen Vice President of the U. S., 1816, on the ticket with Monroe, and reëlected, 1820, when he was an aspirant for the presidential nomination; chancellor of the Univ. of New York; delegate to the State Constitutional Convention of 1821, and for a time its president.

Tom'tit. See TITMOUSE.

Ton, a measure of weight and capacity in Great Britain and the U. S. As the former it is equivalent to 20 cwt., and as, in Great Britain, and the U. S. customhouses, the hundred weight is reckoned at 112 lb., the ton contains 2,240 lb. (the long ton). In the domestic commerce of the U. S. it is customary to reckon only 100 lb. to the cwt. and 2,000 lb. to the ton (the short ton), and this usage in some of the states has received the sanction of law. As a measure of the carrying capacity of a ship, the ton is 40 cu. ft. This is actual tonnage. The register is 100 cu. ft.

Tone, Theobald Wolfe, 1763-98; Irish patriot; b. Dublin, Ireland; was called to the bar, 1789; wrote pamphlets to expose English misgovernment in Ireland; promoted the combination of the Irish Roman Catholics with the Protestant Dissenters in opposition to the British Govt.; founded at Belfast the first society of United Irishmen, 1791; became secretary and agent of the Roman Catholic committee, 1792; involved in secret negotiations with France, on account of which he went to the U. S., 1795; sailed for France, January, 1796; aided the French Directory in fitting out Hoche's projected expedition to Ireland, in which he was appointed brigadier and adjutant general; served in the Bavarian army, 1797; was captured in September, 1798, on board a French squadron bound for Ireland; taken to Dublin, tried by court-martial, and sentenced to death, but committed suicide by cutting his throat.

Tone, in music, a *sound*, or the impression made on the ear by a sonorous body. The derivative meanings of the term relate to the qualities, relations, or conditions of such sounds, as (1) their place on the scale, a high tone or a low tone; (2) the interval made by two sounds, as a major or a minor tone; (3) any special quality of a sound, as a fine, clear, rich, sweet, or feeble tone. In a more technical sense a tone (or whole tone) means one of the steps of the scale, as C—D, G—A, etc.; but the words step and half step are much better as scientific terms than whole tone and semitone.

Tonga (tŏ'ngä) **Is'lands,** formerly called FRIENDLY ISLANDS, three groups, called, respectively, Tonga, Haapai, and Vavau; in the Pacific, SE. of Fiji; area, 390 sq. m.; pop. (1906) 21,240 Tongan Natives; other Pacific islanders, 400; British and foreign residents, 400. The natives are Christians, mostly Wesleyan Methodists. The islands constitute a British protectorate, but are under a king and a legislative assembly. Chief exports, copra, green fruit, fungus, and candle nuts. Capital, Nukualofa.

Ton'galand, or **Amaton'galand**, former independent native state of S. Africa, extending along the coast of the Indian Ocean from Delagoa Bay to St. Lucia Lake and inland to the Transvaal. The Amatonga people are of Zulu extraction, but are much mixed with Swazi blood. In 1897 it was incorporated with the colony of Natal.

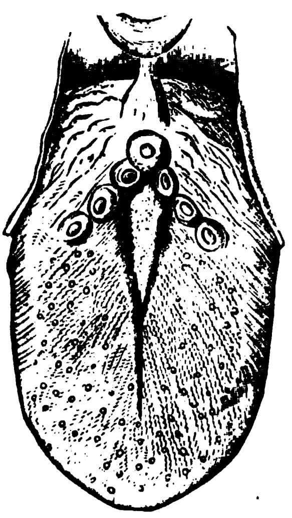
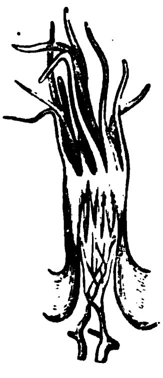
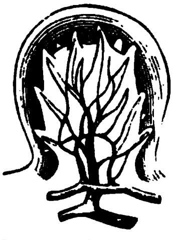


FIG. 1.—THE TONGUE.

Tongue (tŭng), the organ of the special sense of taste, situated on the floor of the mouth; consists of muscles by which it can be protruded, retracted, and curved upward, downward, and laterally. The tongue consists of two symmetrical halves, with a fibrous middle septum; hence one side may be paralyzed and the other active, as in cases of apoplexy. The upper surface or dorsum of the tongue is essentially the seat of taste. It is covered by delicate processes or papillæ, which contain blood vessels and the terminal fibers of the nerves of sensation and taste. The facial nerve has an influence upon taste, paralysis of this nerve impairing the special sense. The papillæ vary in size and length on different parts of the tongue. Food of decided flavor can be definitely distinguished by a single papilla, as found when applied through cylindrical glass rods. Some papillæ contribute to the sense of taste, others to sensation only. Sensation (tactile) is more acute in the tongue than elsewhere. Distinct perception of two needle points was obtained at the tip of the tongue when the points were separated only one twelfth of an inch.





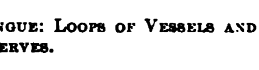


FIG. 2.—PAPILLÆ OF TONGUE: LOOPS OF VESSELS AND NERVES.

The tongue may be inflamed from various causes as hot drinks and irritants. It is often the seat of ulcers, cankers, the result of catarrh of the mouth. The coated tongue may be due to a relaxed, flaccid, and pale condition of the papillæ, and when noticeably coated has an accumulation of thickened saliva; the yellow color is the result of the fatty change which the cast-off cells speedily undergo. When the stomach is inflamed or irritable, the papillæ of the tongue often appear as distinct points. The tongue is occasionally attacked by epithelial cancer. Exceptionally, in infants the fibrous cord beneath the tongue is too short; the tongue-tied infant cannot nurse well, and when older speaks imperfectly; the cure is by cutting. See SENSES; SENSATION; TASTE.

Ton'ic, in medicine, means employed to remove debility, general or special. Nourishing food, fresh air and exercise, cold bathing, etc., have a tonic effect. Drugs, such as directly improve nutrition, or indirectly accomplish the same end by exciting the appetite and increasing digestive power, are called tonics. The most prominent examples of the former are *iron*, which in anemia stimulates the making of red blood corpuscles; *cod-liver oil*, which operates as a fatty food of easy assimilation; *phosphorus*, which in some cases of nervous exhaustion or functional nervous derangements seems to improve the nerve structures; and preparations of some of the metals, as silver, zinc, mercury, arsenic, which in peculiar conditions of malnutrition tend to determine the nutritive processes back into the healthy channels. Of the drugs which are tonic by improving digestive power, the most serviceable are vegetable bitters, as cinchona and its alkaloids, gentian, columbo, quassia, nux vomica, etc.; aromatics and spices, acids, both mineral and organic, and weak alcoholic beverages in very moderate quantity. The list might be greatly extended, for it is a general property of irritants that, taken internally in small doses, their irritation tends to increase the activity of the digestive organs and the secretion of the digestive fluids.

TONIC, in music, the keynote, or prime, of a scale.

Tonic Sol-fa Sys'tem, a musical notation, and the method of teaching music which grows out of it. It is called a natural system, because it treats music properly as having but one scale or alphabet of seven tones. No lines and spaces are used. It consists of the letters d, r, m, f, s, l, t, which are the initials of the Guidonian syllables, doh, ray, me, fah, soh, lah, te (the last changed from se). These notes are applied to all keys alike. Tones above the octave are represented by a figure at the top of the letter (d^1, d^2, etc.); tones below the octave by a figure at the bottom of the latter (s_1, s_2, etc.). The signs for time (rhythm) are based upon the law of accent. A strong accent is represented by a perpendicular line before a note (▌); the weak accent is represented by a colon (:); a medium accent by a shorter, thinner line (|). The space between any two accents represents a beat or pulse. The space between two strong accents represents a measure. A dash between two accent marks shows that the previous tone is to be continued. The four principal forms of measure are herewith given as illustrations:

Two-pulse measure.
{▌d : m | d : — ▌|}

Four-pulse measure.
{▌d : m | s : m ▌d : — | — : — ▌|}

Three-pulse measure.
{▌d : m : s ▌d : — : — ▌|}

Six-pulse measure,
{▌d : m : s | d¹ : s : m ▌d : — : — | — : — : — ▌|}

In these measures each pulse is supposed to represent a quarter note. The shorter notes are represented by divisions of the spaces; eighth notes by a dot in the middle of the space (| d . d:); sixteenth notes by a comma in the middle of the half space (▌d , d , d , d:); triplets by inverted commas (| d‘ d‘ d :). Other forms are shown by combinations of these signs. Silences (rests) are indicated by the absence of notes in the pulse divisions (▌d: |). In the tonic sol-fa system no sharp or flat signatures are required. The pitch of a tune is indicated thus at the beginning: Key C, Key G, Key F, etc. Chromatic tones are represented by the old chromatic names written out. The sharps are de, re, fe, se, le; the flats are ra, ma, sa, la, ta. No naturals, double sharps, or double flats are required in tonic sol-fa, as they are only necessitated by the complex nature of the staff notation.

Tonka Bean. Half of the one-seeded pod.

Ton'ka Bean, the seed of a noble leguminous tree of Guiana. The seed is shaped like a large kidney bean and is shiny black. It abounds in the fragrant principle, coumarine, used in scenting snuff and tobacco, and in perfumery. It is also employed to keep moths from woolens. In medicine, it relieves the paroxysm of whooping cough.

Tonkin' (formerly Tonquin or Tongking), (Eastern Capital), a French dependency of Indo-China, on the Gulf of Tonkin, S. of China, N. of Annam, and E. of the Shan states; area about 34,740 sq. m. It consists of a delta which is densely populated and highly cultivated, and a mountain region which is covered with forests and very sparsely inhabited. The delta is that of the Song-Koi or Red River, which bifurcates at Sontai, and incloses between its numerous arms grassy level fields, easy to cultivate, fertile, and covered with villages, cities, and rice fields. The capital is Hanoi, a city of Chinese aspect; pop. abt. 150,000. The chief port is Haiphong, near the coast. The principal crop is rice, but the sugar cane, cotton, and tobacco are cultivated. There are copper and iron and coal mines. In 1905 the imports were valued at 87,535,550 fr., and the exports at 34,841,850 fr. The transit trade to and from Yunnan amounted to 4,990,000 fr. in imports, and 3,180,000 fr. in exports. Tonkin is yet commercially dependent on the British colonies of Hongkong and Singapore. The climate of Tonkin is hot, but not unwholesome; the people are very poor, suspicious, avaricious, industrious, and skillful. The interior trade is largely in the hands of Chinese. The country was annexed by France in 1884, but remains turbulent. Pop. abt. 10,000,000.

Ton'nage, a measure of the capacity of a ship, used for the purpose of registry at her port for levying harbor and other dues, and to determine how much cargo she can safely carry. The cubical contents of the ship are divided by 100, as 100 cu. ft. are taken as holding one ton, and this gives the "register tonnage."

Tonnage and Pound'age, an ancient tariff on imports and exports levied by the kings of England, nominally for the defense of the realm and the maintenance of the sea power of the kingdom. This tariff had its origin in the royal dominion over the ports and waterways of the kingdom.

Tonnage Dues, a duty levied on merchant vessels as a fee for the privilege of using the harbors of the state. This tax was formerly based on the number of tons of freight actually carried by the vessel, and was assessed separately for every time that a harbor was actually entered, but it is now measured by the registered tonnage of the vessel, and commuted into an annual tax.

Tonsilli'tis, or **Tonsilitis,** inflammation of one or both tonsils, excited by some infectious microörganism, or due to the effects of some specific disease, such as scarlatina or smallpox, which lowers the resistance of the tissues, or some constitutional disease, such as gout.

In acute tonsillitis the affected glands become red and enlarged, and if suppuration occurs, the swelling may be so great as almost completely to block the throat. The pain in swallowing may be intense, and may extend to the ear and cause deafness. If the inflammation does not subside in six days, quinsy occurs, or the tonsils may become chronically enlarged. Sometimes rheumatic pains over the entire body are so severe that the throat symptoms may be overlooked. Tonsillitis usually ends favorably, but it may extend to a large blood vessel and cause death by hemorrhage, or the swelling may be so great as to cause suffocation. Tonsillitis is treated by disinfecting the throat with gargles. Aconite and the salicylates are useful. Chronic enlargement is cured by cutting out the tonsils. See Quinsy.

Ton'sils, two masses of lymphoid tissue in the human throat; each consists of from ten to twenty sacculated depressions of the mucous membrane, in the walls of which are numerous oval lymphatic follicles, .008 to .02 in. in diameter. The parenchyma of these follicles consists of a fine reticulum of connective tissue, the meshes of which are stuffed with lymphoid elements. The follicles are united by a connective tissue rich in blood vessels and lymphatics. At the root of the tongue there are a number of small lymph follicles similar in structure to the tonsils, but simpler, each consisting of a single saccular depression of the mucous membrane, the walls of which are lined by lymphoid tissue. The oral mucous membrane is well supplied with lymphatics, which are especially abundant on the surface of the tongue and about the tonsils.

Ton'sure, in the Roman Catholic and Oriental churches, the shaving of a portion of the hair from the head of an ecclesiastic. In the Roman Catholic Church the size of the tonsure is not uniform, but its place is at present upon the crown of the head. This is the tonsure of St. Peter. In the ancient Irish and British churches the tonsure of St. James, in which the front part of the head was shaved as far back as a line passing over the top of the head from ear to ear, formerly prevailed. In the Eastern churches anciently the whole head was shaved. The tonsure is one of the preparations for orders, and it is regarded as symbolizing the crown of thorns worn during Christ's Passion.

Tontine', a financial scheme for securing to the surviving members of an association a proportional share of the profits of those who have died within a stated interval. The name is derived from Lorenzo Tonti, a Neapolitan banker, who proposed to apply this principle to raise a fund for the French Govt. in 1653. The subscribers were to receive interest from the first, and as deaths occurred the shares of the survivors would be continually increased. The French Parliament rejected the scheme, but public tontines were established in France and Great Britain. A tontine insurance policy is one in which the policy holder agrees in common with others to receive no profits till after a certain number of years, and to forego surrender value if he gives up his policy.

Ton'ty, or **Tonti, Henry** (Chevalier de), abt. 1650–1754; French explorer; b. Gaeta, Italy; accompanied La Salle to Canada, 1678, and in his exploration of the Mississippi; was left in command of a fort near Peoria, 1680; made an unsuccessful attempt to found a settlement in Arkansas; took part in an expedition of the W. Indians against the Senecas, 1685; twice descended the Mississippi in search of La Salle, and a third time to meet Iberville; remained in that region, and died at Fort Louis (now Mobile).

Toombs, Robert, 1810–85; American statesman; b. Wilkes Co., Ga.; educated at Univ. of Georgia and at Union College, Schenectady, N. Y.; studied law at the Univ. of Virginia. In 1830 was admitted to the bar. Served in war against Creek Indians, 1836. He was brought up in the Jeffersonian school of politics, to which creed he always adhered. Member of Congress, 1844. He remained a member of the House until March, 1853, when he took a seat in the Senate, which he held until Georgia passed her ordinance of secession in 1861. He was a member of the State Secession Convention, and was delegate to the Confederate Congress at Montgomery. He was for a short time Secretary of State in the Confederacy, but resigned that office and took a commission as brigadier general in the army. He was at the second Bull Run and Antietam battles. He resigned his commission and returned to Georgia, where he was made a brigadier general of the state militia upon the invasion of the state by Sherman in 1864. After the close of the war he left the country, remaining abroad until 1867. He then returned, but refused to take the oath of allegiance to the U. S. He resumed the successful practice of law. The reconstruction measures of Congress he denounced from the beginning.

Toothache Tree. See Prickly Ash.

To'paz, a gem stone. The *chrysolite* of the old writers is believed to have included the topaz. Its hardness is eight, between that of quartz and sapphire, and diamond and sapphire scratch it easily. It contains silica, alumina, and fluorine. This is the true topaz, but the name is confused among jewelers and collectors by being applied to other transparent yellow stones. Thus Oriental topaz is yellow sapphire, and the names Scotch topaz and Spanish topaz are given to yellow quartz. This latter is commonly sold as topaz, and is produced by heating smoky quartz, which is thus partially decolorized. The true topaz is of various light colors—yellow, pale green, or blue, and pure white. The finest deep-yellow ones come from Minas Geraes, in Brazil; on heating, these are altered to pink, and are then called Brazilian rubies. Sherry-colored stones come from Siberia, Colorado, and Texas, and fine green and blue topazes from the Ural Mountains, Ceylon, Japan, and New S. Wales.

Tope'ka, capital of Kansas and of Shawnee Co.; on the Kansas River, 67 m. W. of Kansas City; 800 to 890 ft. above sea level. The city is built on three ridges at right angles to the river, insuring it excellent drainage.

Topeka contains the State Insane Asylum, the State Reform School for Boys, State Capitol, county courthouse, U. S. Govt. building, hospitals, an orphans' home, and a home for friendless women. The city has an excellent system of public schools, including a high school. The institutions for higher instruction comprise Washburn College (Congregational), coeducational; the College of the Sisters of Bethany (Protestant Episcopal), the Seminary of the Assumption (Roman Catholic), and the Kansas Medical College. There are also private schools and academies.

Topeka has large machine and railroad shops, and packing works.

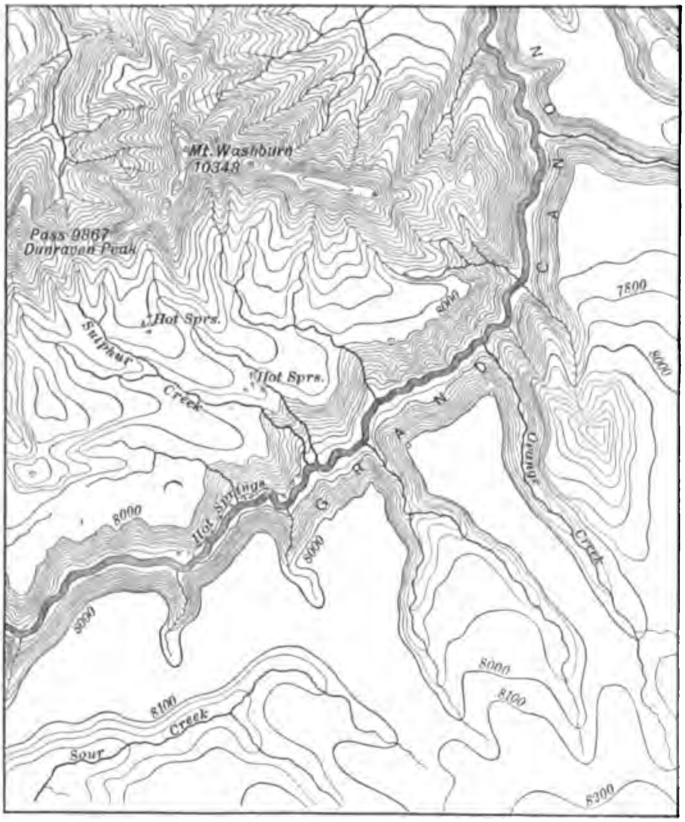
The city was laid out in 1854, incorporated in 1857, and made the state capital in 1861. Since 1885 there have been no saloons in the city. The financial condition of Topeka is exceptionally good. Pop. (1910) 50,000.

To'phet. See Gehenna.

Top'lady, Augustus Montague, 1740–78; English clergyman and hymn writer; b. Farnham, Surrey; educated at Trinity College, Dublin;

took orders in 1762; became vicar of Broad Hembury, Devonshire, 1768; preached at the chapel of the French Calvinists, in Leicester Fields, London. He was editor of *The Gospel Magazine* and author of many hymns, chief of which is "Rock of Ages." His Calvinistic partisanship led him into unhappy controversy with John Wesley.

Topog'raphy, the representation of the natural features of a portion of the surface of the earth on a map, or the natural features themselves. For popular purposes the representation of hills and mountains by lines drawn along the declivities is common, the steepest slopes being made the heaviest. While this indicates the elevations, it gives little idea of their relative heights, and hence the method of contours is more reliable. In this method the surface is supposed to be intersected by a series of horizontal planes, and the lines of intersection, called contours, are determined in the field by levels and measurements and then plotted on the map. The figure, which shows a portion of the Yellowstone Park about 7 m. by 8 m. in area, illustrates the contour method of representing topography, all points on the line marked 8,000 being 8,000 ft. above ocean level. The contours are drawn at intervals of 100 ft. in vertical height, and the closer together they are the steeper is the slope. By the help of accurate contour maps profiles in any direction can be constructed.



In addition to the representation of the elevations and streams, topographical maps generally include roads, houses, swamps, and cultivated land. Special signs, mostly conventional, are used for different kinds of crops, as also for sand, grass, and trees. Along the coast are shown the shoals, reefs, high and low water lines, together with contours of the beds of the harbors and sounds. Colored topographical maps, in which water is represented in blue, streets in yellow, fields in green, and houses in red, are frequently made when not intended for reproduction. The field work of topography is usually based on a triangulation, while the details are mapped by means of the plane table or stadia. The topography and hydrography of the coasts of the U. S. has been mostly done by the U. S. Coast and Geodetic Survey, and a portion of that of the interior by the U. S. Geological Survey. The cost of topographical work ranges from $5 to $25 per sq. m., depending on its accuracy and completeness. See GEOGRAPHY.

Tordesillas (tŏr-dā-sēl'-yăs), **Conven'tion of**, an important treaty signed by the envoys of Spain and Portugal at Tordesillas, Spain, June 7, 1494. It related to the rights of conquest of the two countries, and had the most important results. The popes, in several bulls, had given authority to Portugal to conquer and settle Africa and the E. Indies. Soon after the discovery of W. lands by Columbus, Alexander VI issued his bull of May 3, 1493, in which he divided the world by a meridian "100 leagues W. of the Azores and Cape Verde Islands," and gave to Spain authority to conquer all lands W. of this line, reserving those E. of it for Portugal. By the convention of Tordesillas it was agreed that the divisional meridian should be moved to "370 leagues W. of the Cape Verde Islands." Very unexpectedly this gave to Portugal the coast of Brazil, discovered a few years after. Spain could not reasonably contest the claim, and Brazil was settled by Portuguese. But the treaty was vague in not mentioning the point of the Cape Verde Islands from which measurements could be taken, and in not specifying the length of the leagues, several being then in common use; thus disputes arose, and remains of these have come down to our time. Again, as conquests were pushed E.

and W., the two nations eventually met on the opposite side of the globe, and here the uncertainty was increased by the defective means for determining longitude. For example, the Philippines were claimed and held by Spain on the supposition that they lay within her hemisphere; in reality, they were in that assigned to Portugal.

Torna'do, a small, local, short-lived, but very violent storm, occurring in the warm season, in the warmer hours of the day, and in very moist air. The tornado is most noteworthy for the high velocities attained by the innermost part of its whirl, reaching, as far as can be judged by its effects, a speed of 200 or more m. an hour, and consequently exerting a pressure of 200 lb. or more to the square foot on structures opposing the motion. The conditions preceding a tornado are generally those of a thunderstorm exaggerated, and active agitation is sometimes seen beforehand in the clouds. When the storm is formed it has a long, slender funnel extending from the clouds toward the ground. This defines the area of greatest velocity of wind, and where it reaches the ground the destructive effects are greatest. The tornado is often accompanied by intense electric phenomena, and accompanied or followed by torrential rain, sometimes by hail. The path is usually but a few rods wide and a few miles long, and it is generally directed from SW. to NE. The destructive effects are experienced only close to the path of the funnel, and are somewhat more severe on the S. side of the central path than on the N. side. The duration at any spot is but a few seconds. Definite forecasts of storms whose entire destructive area is not a square mile are hardly practicable, but the smallness of this area makes the probability very small that any given spot will ever be traversed by a tornado. Tornadoes occur in the temperate regions generally, where there is enough moisture. In the U. S. they are most usual E. of the great plains, in early spring in the S., in late spring and early summer in the N. states. The alleged greater frequency of tornadoes in late years is an illusion due to the greater perfection of the news collecting and close watching of meteorologic phenomena.

The theory of tornadoes presents many difficulties, but they are undoubtedly small vortical wind systems, with a long vertical axis, with contra-clockwise rotation at the ground. Many other local storms are erroneously classed with them, as squalls, derechos, riband-winds, rolls with horizontal axes, etc. A serious source of confusion is that these local storms are popularly called cyclones. A cyclone is several hundred miles in diameter and only a mile or two deep, with a thickness, therefore, only $\frac{1}{500}$th part or so of its diameter. A tornado is only a few scores of feet in diameter and at least several hundred feet high. The first is general, large, and may last several days; the second local, small, lasting at most only an hour or two. A tornado in April, 1908, passed over Louisiana, Mississippi, and other S. states, killing over 400 persons, maiming many more, and doing damage aggregating millions of dollars. See CYCLONE; HURRICANES.

Toron'to, capital of the province of Ontario, and the largest city on the Canadian side of the Great Lakes; on a sheltered bay on the N. shore of Lake Ontario. The city was founded in 1794 by Major-gen. John Graves Simcoe, first Governor of Upper Canada, who named it York. About fifty years earlier the French had a trading post (Fort Rouillé) close to the site of the city, but this was later destroyed. The name Toronto—"the place of meeting"—was adopted in 1834. The determining factor in the location of the city was the spacious harbor, besides the advantages of fine central position. Later years have justified the selection of the site, and made tributary to the city's commerce the trade of the Ontario Peninsula and the vast and fertile plains of the Canadian NW. Toronto is 39 m. NE. of Hamilton, at the head, and 160 m. W. of Kingston, at the foot, of Lake Ontario. It is 333 m. from Montreal and 500 m. from New York.

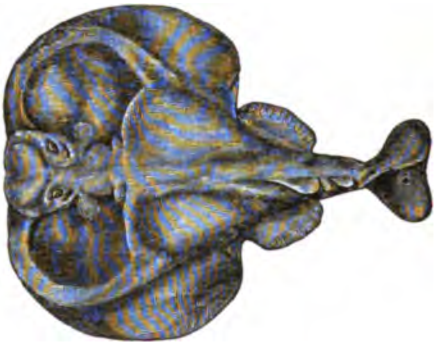
Although not picturesque, in the sense that Montreal and Quebec are picturesque, Toronto is not lacking in beauty. Its chief adornment is its fine water front, as seen from the harbor or from the island, a large sandbar 6 m. long, which protects it from the lake. The island is largely a public park of great beauty, and the rest is covered with summer homes. The city covers an area of over 16 sq. m., and includes within its municipal boundary, besides the city proper, the once outlying suburbs of Brockton, Parkdale, Seaton Village, Yorkville, Riverdale, West Toronto and East Toronto. The site has a rising inclination toward the N. limits, 2½ m. from the water front. The shore front extends from the river Humber, on the W., to Munroe Park, near Scarboro Heights, on the E., a distance of 9 m. The streets are well paved and lighted, neatly laid out, and regularly built. The business area lies adjacent to the water front and the esplanade, which is monopolized by the lake traffic and the railways. The residential portion lies chiefly to the N., bisected by the city's great artery—Yonge Street, an old military road running N. to the Georgian Bay.

The notable buildings are the courthouse and municipal buildings, the customhouse, the post office, the Board of Trade Building. Toronto is rich in public parks, gardens, drives, theaters, and places of recreation and resort. High Park, in the W. section, is the largest, and Queen's Park is the most accessible and attractive. One of the most popular summer places of amusement is the island which lies off the city front, and which bears the same relation to Toronto that Coney Island does to New York or New Brighton to Liverpool. The principal educational institution is the provincial university, known as the University of Toronto, and situated in Queen's Park. The Normal School buildings house the Provincial Museum and art collection and contain the headquarters of the Province's educational department. Affiliated with the university are the theological colleges, *viz.*: Trinity, a fine academical institution and training college, giving instruction in divinity, arts, and medicine; the Roman Catholic college (St. Michael's), the Presbyterian college (Knox), the Methodist (Victoria), and Wycliffe College (Evangelical Church of England). There is also a school of science affiliated with the university. Besides these, the Baptists have an independent university, known as McMaster Univ. Higher education has an historic institution in Upper Canada College, at Deer Park. Law has its representative home in Osgoode Hall, situated on Queen Street W., where are the great law courts of the province, together with the Convocation Hall and library of the Law Society of Upper Canada. The city has equipped and maintains a large number of hospitals and charitable institutions. The more important of these are the Toronto General Hospital, St. Michael's, Western, and Grace Hospital.

The Parliament Buildings contain, besides the single-chambered legislature, the library, the parliamentary committee rooms, and departmental offices. Government House is the residence of the lieutenant governor of the province. The older representative places of worship include St. James's Cathedral and St. George's Church (Episcopal), St. Michael's (Roman Catholic), Knox and St. Andrew's (Presbyterian), Jarvis Street (Baptist), and Zion Church (Congregational). There are not less than 160 places of worship, exclusive of missions. The municipal affairs are administered by a mayor and four controllers, elected by the whole city, and twenty aldermen. The Board of Control, consisting of the mayor and four controllers, have extensive powers. As a commercial center the city has, except Montreal, no rival in the Dominion. The richest province in Canada is tributary to Toronto, and her trade ramifications extend not only from the Atlantic to the Pacific, but to other colonies of Britain. The industries include shipbuilding and metal work and the manufacture of machinery of all kinds, white lead, paints, furniture, musical instruments, automobiles, boots and shoes, clothing, confectionery, carpets, flour, liquors, etc. There are excellent facilities for shipping and transport making the city an important wholesale and distributing centre. Railways radiate in all directions. A unique feature in connection with the city is its annual exhibition, the greatest of its kind in the world.

In 1894 Toronto commemorated the hundredth anniversary of the passing of the Constitutional Act of 1791, which set apart the province of Upper Canada and gave rise (1794) to the embryo capital. Toronto was fortunate, in its beginnings, in receiving among its sturdy early settlers a large contingent of the United Empire loyalists. During the War of 1812 the town was twice sacked and burned by U. S. troops, though on one occasion at serious loss to the invaders. Recovering from this disaster, the town advanced apace. In 1834 it rose to the dignity of an incorporated city, and gained a population of 9,254. Presently Toronto passed into its high prerogative era and accompanying period of political discontent, the issue of which was the rebellion of 1837, and the hard-won measures of reform culminating in self-government. With the union (in 1841) of the two old Canadas and the confederation (in 1867) of all the British N. American provinces Toronto forged ahead and became the capital of the newly named province of Ontario and the seat of the provincial government. Pop. (1910) 405,000.

Torpe'do, family of skates noted for their electrical powers, which have caused them to be called crampfish, numbfish, etc. About twenty species are known, but those most studied belong to the genus *Torpedo*, three of which occur in Europe and one (*T. occidentalis*) on the E. coast of the U. S. In these the body is a broad, rounded disk, the large fleshy tail resembling that of a shark. The mouth is of moderate size, the teeth pointed, and the skin smooth. The electrical organs occur on either side of the head, and are made up of prisms of connective tissue in which run nerves and blood vessels, while the prisms themselves are filled with gelatinous substance in which are "electrical plates" in which the nerves terminate, and which are apparently modified motor end plates of the muscle. The physics of the electrical generation is as yet unknown. The current produced will deflect a needle, decompose water, etc., and its production is under the control of the will. It is probably employed by the fish as a means of offense and defense.



AMERICAN TORPEDO.

Torpedo Boats, small, swift war vessels, whose purpose is to approach a ship and destroy it by discharging a torpedo. They may either proceed with a fleet as sea-going torpedo boats, or be launched at sea in the vicinity of the enemy from a battleship or depot ship. A sea-going torpedo boat is usually about 150 ft. long, 6 ft. broad, and draws about 5 ft. In construction much is sacrificed to speed, for it is essential that a torpedo boat shall cross the zone of fire of an enemy's ship before it is picked up by the search lights and the rapid-fire guns brought to bear upon it. If it can effectively deliver its terrible missile, its purpose is accomplished, and its own destruction is a secondary matter. Over 30 knots, or a speed of 35 m. an hour, must be attained by a modern torpedo boat, and to do this the highest power must be packed in the smallest space compatible with seaworthiness. Double engines and boilers are installed, each in a separate compartment, so that if one is crippled it may be shut off from the others without stopping the boat or withdrawing from action. The deck of a torpedo boat is low, arched, and water tight, so that it may be inconspicuous and dash through the waves when approaching its object.

In addition to their destructive efficiency and their moral effect upon an enemy, torpedo boats are an economical method of providing for the home defense of ports. Stationed in numbers in different ports, or massed at threatened localities, by inland waterways, where such routes of communication exist, their presence would be a constant menace to an investing naval force, which, however powerful, would always be in danger of destruction whenever opportunity might offer for a sortie of the torpedo boats. Large torpedo boats fitted with rapid-fire batteries, and designed to protect larger ships from torpedo attacks, are known as torpedo-boat destroyers.

Torpe'does, submarine devices containing explosives and designed to destroy hostile shipping. They are either contrivances propelled through the water so as to strike the enemy's ship, or submerged mines arranged to be set off when a ship is over them. The germ of the idea is found in the Greek fire of the ancients, from which the torpedo has been developed. The earliest "infernal machine" on record dates from the siege of Antwerp in 1585, where an Italian engineer, Zambelli, destroyed a bridge over the Scheldt by setting adrift against it four scows, each carrying a masonry mine heavily charged with gunpowder.

It was reserved for American engineers to demonstrate upon a grand scale the important part which the modern torpedo can be made to play in maritime warfare. The Civil War of 1861–65 offered conditions peculiarly favorable to its development. The S. Confederacy was possessed of no fleet worthy of the name, while a long seacoast and many navigable rivers exposed its territory to easy assault by water. It could, therefore, well afford to sacrifice most of those routes of communication, provided they could be closed to the war vessels of the Union. Every variety of torpedo became, therefore, admissible. The service was formally legalized in October, 1862, and an efficient bureau was established at Richmond, which continually extended the scope of its operations until the end of the war. Seven U. S. ironclads, thirteen wooden war vessels, and seven army transports were destroyed by torpedoes, and eight more vessels were more or less injured. The Confederates lost four vessels by their own mines, and a fine ironclad, the *Albemarle*, by the counter operations of the U. S. fleet. The charges employed were usually enormous, amounting to 2,000 lb. of gunpowder. Offensive spar torpedoes afforded the best opportunity for the display of personal gallantry, and several officers won distinction in its use. An outrigger spar from 20 to 30 ft. in length carried a torpedo designed to be brought in contact with the enemy's hull and exploded in a hand-to-hand conflict.

The Whitehead is probably the best-known form of torpedo. It is an iron and steel spindle driven by compressed air, and capable of a speed of over 30 knots for a run of 500 yds. It carries a charge of 250 lb. of gun cotton. The torpedo can be projected from a launching tube or started by hand, and is capable of regulating and preserving its depth and direction, within narrow limits, in still water; but cross currents or seaweed may introduce variations. It can be set to explode on contact or after a definite time, and to either sink or rise to the surface after finishing its course. The Schwartzkopff torpedo is essentially a Whitehead encased in phosphor bronze instead of steel. The Howell torpedo, devised by a U. S. naval officer, has been slowly developed until it has become a formidable rival of the Whitehead, from which it differs chiefly in motive power. This is derived from the rapid revolution of a heavy fly wheel transmitted to the propeller shafts by beveled gearing. A speed of 22 knots and, what is more important, an inherent directive force giving great precision of fire are claimed. See SUBMARINE; NAVY.

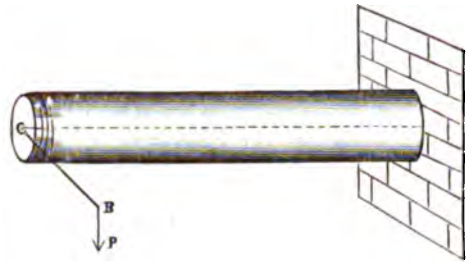
Torquemada (tŏr-kā-mä'thä), **Tomas de,** abt. 1420–98; Spanish inquisitor; b. Valladolid; became a Dominican monk and prior of the monastery of Santa Cruz at Segovia; was appointed by Ferdinand and Isabella first Inquisitor General of Spain, 1483, and confirmed by Pope Innocent VIII in 1487; labored with vigor and success in organizing the Inquisition throughout Spain, and was influential in causing the expulsion of Jews and Moors. While the number of persons burned during his administration has been exaggerated, his cruelty was so great that in his later years his authority was curtailed by the appointment of four colleagues by orders of Pope Alexander VI.

Tor'rens Sys'tem (of land registration), a plan under which the government guarantees the title of the land to the registered owner, as distinguished from the system of registration of deeds where the registration carries with it no guaranty of title, but simply serves either as a protection to third parties, by affording them notice of transfers, or incumbrances of real estate, or assistance to the owners of property in affording them a cheap and convenient method of ascertaining the title to their property. Under the guaranty system every deed of transfer, conveyance, or lien, must be be examined with respect to its validity as a condition of registration, while under the system of registration of deeds such examination is not necessary, except so far as it may be required to comply with certain requirements, such as being properly acknowledged and witnessed.

Tor'res Strait, the channel which separates New Guinea from Australia. It is 80 m. broad, but covered with islands and full of shoals and reefs, which makes its navigation difficult. It was discovered by Torres in 1606.

Torricelli (tŏr-rē-chĕl'lē), **Evangelista,** 1608–47; Italian physicist; b. Faenza; studied under Galileo, whom he succeeded in 1642 as professor at the Academy. In 1644 he published his "Opera Geometrica." His most remarkable discovery is that of the barometer.

Tor'sion, the twisting of a bar or shaft around its axis. In the figure is seen a horizontal bar, with one end rigidly fixed in a wall and the other subject to a vertical force, P, acting with a lever arm, BC. The product P × BC is the twisting moment whose tendency is to cause all horizontal lines on the surface of the bar to assume a spiral form. This moment is resisted by the sum of the moments of the internal shearing stresses which exist in any cross-section.



Torsion Bal'ance, an apparatus for measuring delicate electrical or other attractions and repulsions. The attraction or repulsion is measured by the resistance offered to it by the twisting of a metal wire or a thread of spun glass, quartz, or other fiber. By this means Coulomb discovered the laws of electrical attraction and magnetic force, and Cavendish deduced a value of the density of the earth.

Tort, in English and American law, an unlawful invasion by one party of another's rights which are created by law and remediable by a common-law action, such as assault, defamation, maintaining a nuisance, trespass, etc. In some cases the wrongdoer may be sued on contract or in tort, as when a carrier fails to deliver goods he may be sued on his contract of shipment, or in tort for his breach of the common-law duty to carry safely and deliver. The act constituting a tort may be also a crime, as an assault, which may lead to prosecution by the state as well as to recovery of damages by the person injured. See CRIME; FELONY; MISDEMEANOR.

Tor'toise, a name sometimes applied to any turtle, but correctly restricted to the *Testudinidæ*, a group whose members live altogether on land, have clubfeet, and, as a rule, high, arched shells. There are fifty species, inhabiting the warmer portions of the globe, the most remarkable being the large black species found on the Galapagos Islands and Aldabra. The shell of some measures over 4 ft. in length, the animal weighing 800 lb. They feed entirely on vegetables, are good eating, and yield an excellent oil. Tortoises of this kind formerly abounded in Mauritius and Réunion, but "they have been eaten off the face of the earth." The gopher of the S. and SW. U. S. is a true tortoise, but the name is more commonly applied to the pouched rat. See TURTLE.

SCULPTURED TORTOISE.

Tortoise Shell, the overlapping scales which cover a large turtle found in the tropical Atlantic and Indian oceans and in the Pacific. They are known as hawkbill turtles. Tortoise shell is plastic, so that it may be given almost any desired shape while under the influence of heat. Pieces of the shell may even be welded together, and the filings and chips are molded and shaped as desired. Tortoise shell is used for making combs, toilet articles, etc., and inlaying boxes. It is imitated by compounds, such as celluloid, of much less cost. It is customary in some regions to apply heat to the back of the living tortoise and then remove the plates, but the shell which replaces the first is thin and inferior.

SHELL OF THE PAINTED TORTOISE.

Tortu'gas. See DRY TORTUGAS.

Tor'ture, the infliction of severe pain, as punishment or for revenge, or to extract evidence in criminal or ecclesiastical trials. Among savages it takes the form of the ordeal. Judicial torture, as it was called when used under the direction of courts of law, was a part of the jurisprudence of Europe (except Great Britain and Sweden) till the beginning of the nineteenth century. It was swept away in Saxony in 1783, and about the same time in Switzerland and Austria; in Russia it was partly abolished in 1762 and finally in 1801; in Württemberg it was abolished in 1806, in Bavaria in 1807, in France in 1789 (temporarily restored in 1814), in Hanover in 1819, and in Baden in 1831. It does not appear to have been used by the Hindus, Hebrews, or Egyptians; but was practiced by the Greeks and Romans, especially when the witness examined was a slave. The Roman law authorized the rack, the scourge, fire, and hooks for tearing the flesh. The severest tortures were inflicted by the Inquisition. Although torture was never a part of the common law of England as a means of obtaining evidence, there is proof that it was practiced for that purpose under Henry VIII and his children, and also under James I and Charles I, not only in political cases, but in the case of common crimes.

To'ry (from Irish *toiridhe*, pursuer, searcher, plunderer), name applied to the Roman Catholic outlaws who lived in the bogs of Ireland during the reign of Charles II; afterwards extended (1679) to all who opposed the bill excluding the Duke of York from the succession. It was thus sought to imply Roman Catholic sympathies. Finally, the name came to designate the Antiwhig party in British politics; but as a formal designation it has been replaced by Conservative since 1830. In the war of the Revolution in the U. S. the loyalists were called Tories. See Whig and Tory.

To'tal Ab'stinence. See Abstinence, Total.

To'temism, a system of beliefs and obligations found in most savage communities. A totem is any class of animals or plants, or even inanimate objects, which are looked upon by a clan or individual with superstitious respect. The savage believes that he is descended from his totem, and that it protects him through life. Sometimes the totem is a part only of the natural object, as among the Omahas, where the buffalo is subdivided into head, shoulder, side, tail, each being the totem of a subclan. These split totems indicate the subdivision of what was once a single clan. Men and women owning the same totem must defend one another and redress one another's wrongs. Absolute prohibition of marriage between man and woman of the same totem is the rule. Herbert Spencer argues that plant and animal worship grew out of ghost worship through a confusion of names. Tylor attaches chief importance to the habit of personifying all objects, which is characteristic of the child and of the primitive man.

Tou'cans, a family of birds of gaudy plumage somewhat related to the cuckoos, and peculiar to tropical America, extending N. to Mexico, but not found in the U. S. They frequent lofty trees in flocks, feeding upon fruits, especially the banana, and also upon insects, and even reptiles and young birds and eggs. They build nests in holes in tree trunks. They have enormous, bright-colored bills, which, however, are light, being nearly hollow and filled with air; the upper bill is curved downward and toothed like a saw. Toucans may be tamed and kept as pets.

Yellow Toucan.

Touch, the sense by which contact or pressure upon the surface of the body is perceived. This power is developed to a variable degree upon different surfaces, the sensibility of some being very acute, other parts being relatively obtuse. The acuteness of touch is due in part to the number and distribution of nerve fibers, in part to habitual education. The tactile sensibility of parts is measured by means of needle points in arms movable upon a graduated bar—termed the "æsthesiometer." The shortest distance on the surface at which distinct perceptions of the two points are felt gives the sensibility. The following will suffice to illustrate. The unit of measure is a line, one twelfth of an inch:

Tip of tongue	0.483 of a line.
Palm of forefinger	0.603 of a line.
Surface of lip	1.500 of a line.
Skin of cheek	4.541 of a line.
Forehead	6.000 of a line.
Leg	13.708 of a line.
Middle of back	24.208 of a line.

Each artisan in his line acquires wonderful tactile recognition of the kind and quality of fabrics, minute sizes, shapes, and relative smoothness of surfaces. In the blind it is highly developed. In the sensitive tactile part at the finger tip the touch corpuscles are situated near the surface, constituting sensitive papillæ; as many as 108 have been found in one fiftieth of a sq. in. See Sensation; Senses.

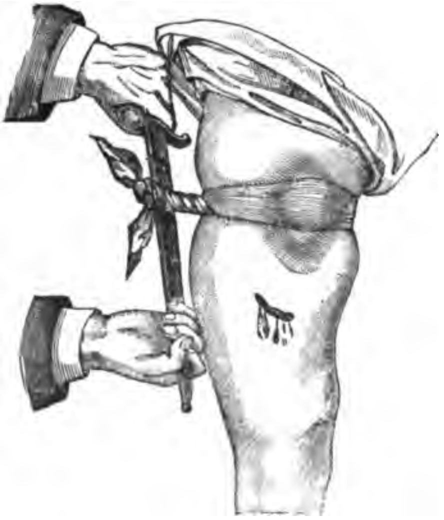
Toulon (tô-lōṅ'), town, department of Var, France; 42 m. ESE. of Marseilles. It is at the head of a narrow but deep inlet of the Mediterranean, from which it rises like an amphitheater on an acclivity. Next to Brest, Toulon is the principal naval station of France, and all the commanding heights in the neighborhood bristle with fortifications. The harbor is double; one part, given up to commerce, is lined with quays; the other is fitted for naval purposes. Toulon carries on a considerable trade with Algeria. Pop. of commune (1906) 103,549.

Toulouse (tô'lôz), capital of department of Haute-Gironne, France; 160 m. SE. of Bordeaux. The older portion is poorly built, with crooked, narrow streets. The cathedral dates from the twelfth century. The church of St. Sernin, one of the most beautiful Romanesque structures in France, was begun in the eleventh century. Toulouse has a noted university, museum, and library; also military schools, arsenals, etc. The textile industries are important, and commerce is active in grain, wine, marble from the Pyrenees, etc. April 10, 1814, the French under Soult were here defeated by Wellington. Pop. (1906) 149,438.

Tour'maline, a mineral occasionally furnishing fine gems. It is a complex silicate of aluminum. It occurs in brittle crystals, usually black, but often rich brown. Tourmalines of blue, green, pink, and red colors occur, with two or three colors in the same crystal. The black is called *schorl*, the white *achroite*, the red *rubellite*, and the blue *indicolite*, or, when clear, *Brazilian sapphire*; and different shades of green, *Brazilian emerald* and *Brazilian chrysolite*; and the yellow, *Ceylon peridot*. Tourmalines are found in Maine, California, Brazil, the island of Elba, Madagascar, S. California, and Ceylon. The mineral is remarkable also for its optical properties, and is used for experiments in polarized light.

Tour′nament, or **Tour′ney,** a friendly contest at arms among the warriors of noble birth in the Middle Ages. The lists were laid out and fenced in and fitted with seats for ladies and others, and the combats were arranged with care and fought under exact supervision in the fourteenth and fifteenth centuries; before that these gatherings were less ceremonious, and indeed were less frequent, and were often forbidden, not only by the Church, but by kings. This would seem to point to much greater danger to life and limb from the earlier tournaments, and it is certain that the arms of war were more used in these than afterwards. In fact, the distinction must have been hard to make at first between the judicial duel and the friendly contest between two; and in like manner a tournament must have resembled a pitched battle to establish a noble's right to an estate or to a title, or merely out of bravado.

When, however, the tournaments had become matters of regulation, the arms used were generally blunt and pointless swords, or clubs of wood, and, for the tilting match, lances with heads divided into blunt points. The defensive armor was enormously heavy, because the rider was not to dismount, but only to run so many courses with the lance and to strike so many blows with the sword or mace. In this way the tournaments became more occasions for unbounded display of wealth and splendor, and less dangerous as contests of armed men. The death of Henry II of France, by an accident in the tilt, in 1559, is thought to have put an end to tournaments in France; but throughout Europe the changing conditions of warfare and the more critical temper of the revival of learning were making them impossible. Exhibitions of military drill, sports, and horsemanship are often called tournaments. See CHIVALRY; JOUST.



ARRESTING HEMORRHAGE FROM FEMORAL ARTERY BY THE USE OF AN IMPROVISED TOURNIQUET.

Tourniquet (tôr′nĭ-kĕt), an instrument for checking the flow of blood from wounds or during surgical operation by means of pressure applied to the principal artery supplying the blood. A useful tourniquet may be made by tying a handkerchief around the limb between the heart and the wound, passing a stick through the handkerchief, and then twisting it till the flow of blood is checked.

Tours (tôr), capital of the department of Indre-et-Loire, France; 147 m. SW. of Paris; on a strip of land between the Cher and the Loire, which here is crossed by one of the finest bridges in Europe. It has a magnificent Gothic cathedral and good educational institutions. Silk manufactures were established here by Henry IV; but the revocation of the Edict of Nantes drove the workmen into exile, and gave the city a blow from which it never recovered, though its manufactures of silk stuffs, ribbons, serges, pottery, and confectionery are still extensive. The town has given its name to the battle between Charles Martel and the Saracens in 732. The latter were decisively defeated, and W. Europe was saved from subjection to the Mohammedans. During the war with Germany, Tours was the seat of the national government from September 11th to December 10, 1870. It was occupied by the Germans, January 19, 1871. Pop. (1906) 67,601.

Toussaint Louverture (tô-săṅ′ lô-vĕr-tür′), or **L'Ouverture, Dominique François,** 1743–1803; Haitian revolutionist; b. Cap Français, Haiti. He was a negro, and originally a slave on a plantation belonging to the Jesuits; they gave him the rudiments of education, and he became an overseer. With Jean François he went over to the Spanish Dominicans in 1793, but in 1794 he deserted to the French republicans, carrying with him a large force of blacks. This step gave the republicans overwhelming power, and, as Toussaint was the leader of the negroes and could turn the scale, he became most influential. He was made commander in chief and deputy governor, and the French commissioner had only a semblance of power. Mainly through Toussaint's generalship the British were forced to evacuate the island in 1798. Their commander, Gen. Maitland, surrendered directly to Toussaint, refusing to recognize the French commissioner.

Soon after an insurrection, secretly incited by Toussaint, drove the commissioner from the island; the mulatto, Gen. Rigaud, to whom he delegated his powers, was defeated by Toussaint in 1799, leaving the latter undisputed master of the W. or French part of the island. He used his power with moderation, protected the whites, and proclaimed a general amnesty. As the only available means of restoring prosperity he forced the negroes to work on the plantations, securing to them, however, a part of the profits. The E. part of the island having been ceded to France, he occupied it in 1801. In July, 1801, he promulgated a constitution which made him president for life. Under his rule the island was prosperous, and he won not only the respect but the devotion of the negroes. An admirer of Bonaparte, he modeled his actions and conversation after him, and claimed to have seized the supreme power in the same manner. One of his numerous letters to the First Consul was superscribed, "The First of the Blacks to the First of the Whites." Bonaparte paid no attention to these letters, and when Toussaint threw off all semblance of subjection to France he organized an expedition to reduce the island (1802). Toussaint made a desperate resistance, finally capitulating. He was pardoned, but two months afterwards was arrested for alleged conspiracy, and sent a prisoner to France. He died in captivity at the castle of Joux, near Pontarlier.

Tow'er, a building generally higher than wide. The towers of an ancient fortress were partly flanking works to allow a cross fire of arrows, etc. In Italian cities lofty square towers were erected for defense, hundreds existing in a single town. (See LEANING TOWERS.) Church towers, intended at first for belfries, became in the Middle Ages the chief means of decorative architecture. In the N. of Europe the church tower was closely united with the mass of the church, but in Italy it was always a belfry or *campanile,* almost wholly detached from the church. The minarets of the mosques are a striking feature of Mohammedan cities. *Tourelles* or turrets are small towers forming part of larger buildings. The round towers of Ireland are slender, nearly cylindrical, with a slight taper, roughly built of stone, and always near to a church. Only about a dozen remain nearly complete, but more than a hundred in ruins exist. Many works have been written attempting to explain their purpose.

Tower of Lon'don, the ancient citadel of London, standing, as the Louvre does in Paris, on the bank of the river, immediately below and outside of the city, which it once defended. The oldest portion is the isolated donjon or keep called the White Tower, built by William the Conqueror, and contains an interesting chapel of the same period. This is now surrounded by a rampart and moat, with inner wall (the Inner Bail), flanked by half-circle towers, each of which has a distinctive name, as the Bell Tower, the Beauchamp Tower, Wakefield Tower (where are kept the regalia), Bloody Tower, Bowyer Tower. There is also within the inclosure the Horse Armory, a museum of armor, St. Peter's Church, where are interred Anne Boleyn, Katherine Howard, Dukes of Somerset ("The Protector") and Northumberland, Lady Jane Grey and her husband, and many other celebrated victims of the headsman. Close to the Tower is Tower Hill, the place of execution. Here suffered (among others) Bishop Fisher, Sir Thomas More, Lord Guilford Dudley, Earl of Strafford, Archbishop Laud, Algernon Sydney, and (1747) Lord Lovat, the last person beheaded in England. Queen Anne Boleyn and Lady Jane Grey were beheaded on scaffolds within the Tower, the site of which is shown. Within the Bloody Tower took place the murders of the princes, sons of Edward IV, and, elsewhere within the precincts, of Henry VI, of the Duke of Clarence, of Sir Thomas Overbury, and of the Earl of Essex.

Towers of Si'lence, the structures on which the modern Parsees dispose of the dead by allowing them to be devoured by vultures. According to the Zoroastrian religion the elements, fire, earth, and water, were sacred, and not to be defiled; the dead body, as full of corruption and pollution, could not therefore be burned, buried, nor thrown into the water, but was exposed on mountain heights, as a prey to the dogs and birds. The modern Parsee *dakhma,* or tower of silence, is from 60 to 90 ft. in diameter, and 20 to 30 ft. in height, resembling a gasometer. The interior raised floor upon which the dead bodies are placed is divided, like the spokes of a wheel, into three concentric rows of troughs, the outer for men, the middle for women, the inner for children. The center is a great pit (*bhandar*), into which the bones, parched and dried in the Oriental sun, are later deposited, and there crumble into dust. No one is allowed to witness the descent of the "heaven-sent" birds; the body, it is said, is quite stripped of flesh in an hour or two.

Town, a word of varying signification, both in popular speech and in legal usage. In its broadest sense, it includes not only every sort of municipality, but also populated districts which are destitute of self-governing powers. The House of Lords has declared that a town exists, within the meaning of that word in a railroad statute, "where there is such an amount of continuous occupancy of ground by houses that persons may be said to be living as it were in the same town or place continuously." As a generic legal term, however, it ordinarily includes only municipalities; that is, political subdivisions less than counties established for local government.

As a specific term it is used (1) to designate a municipality, which is not a city nor a borough nor a village, without regard to its size or form of government. It has this meaning in Pennsylvania, Maryland, Virginia, and some other states, as well as in the Federal statutes relating to town sites on the public lands. (2) In some of the states municipalities are divided into cities, towns, and villages; those having 2,000 inhabitants or more, for example, are declared to be cities; those having less than 2,000, and not less than 500, are towns; those having less than 500 are villages. (3) Again, the term designates a territorial subdivision, which is the unit of local administration; in this sense it is employed by Blackstone. It bears this meaning in New England, in New York, and in several of the W. states. At first, the New England town consisted of clusters of inhabitants dwelling near one another, but as soon as the territorial boundaries of these village communities were fixed, the term was applied to the territory or district. The term township was used interchangeably with town.

In New Jersey, Pennsylvania, and some other commonwealths, as well as in Canada, the word township is used exclusively to designate this primary division of the state. In the Federal statutes relating to public lands, however, and in the nomenclature of the new W. states, the township is a territorial subdivision, made by the intersection of meridians and parallels 6 m. apart, and containing an area of 36 sq. m., but is not a political subdivision. It has no function of local government. See Municipal Corporations.

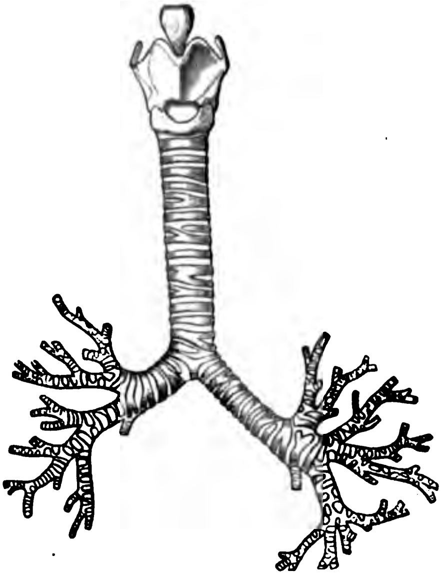
Townshend (town'zĕnd), **Charles** (second Viscount Townshend), 1674–1738; English statesman; b. Rainham, England; was joint plenipotentiary with Marlborough (1709) at the conferences of Gertruydenburg for negotiating a peace with France, and ambassador to the States-General of Holland, 1709–10; signed the Barrier Treaty at The Hague, October 29, 1709; was censured by the Commons for having signed the Barrier Treaty, and declared an enemy to the queen and kingdom; entered into correspondence with the Elector of Hanover, who, on his accession to the throne of England, made him Secretary of State and Prime Minister, September 14, 1714; resigned, became President of the Council, June, 1720, and again Secretary of State, 1721; retired on account of differences with his brother-in-law and colleague, Sir Robert Walpole.

Townshend, Charles, 1725–67; English statesman; grandson of the second viscount; entered the House of Commons, 1747, where he acquired prominence by a speech on the Marriage Bill, 1753. In 1754 he became a Lord of the Admiralty, but was dismissed for an attack on the ministry; Treasurer of the Chamber, 1756, and, 1757, member of the Privy Council, but in 1760 ranged himself on the side of Bute, and was Secretary of War, 1761–62. He was for a time in opposition, but accepted the office of paymaster of the forces, 1765, and supported Grenville's Stamp Act; Chancellor of the Exchequer and Lord of the Treasury under Pitt, 1766; and virtually Prime Minister during the retirement of Pitt. His last act was to introduce the resolutions for taxing the American colonies in 1767. For the instability of his political opinions he was known as the "Weathercock," but he had an immense parliamentary reputation for oratory and wit. His character has been largely discussed by Macaulay (who said "he was a man of splendid talents, of lax principles, and of boundless vanity and presumption") and by historians of the American War.

Toxæ'mia. See Blood Poisoning.

Toxicol'ogy, the science of poisons. It treats of the nature and properties of poisons, their effects upon the animal system, their detection, and the legal questions connected with poisoning. See Antidote; Poison.

Trachea (trā'kē-ā), the tube which in all air-breathing vertebrates carries the air from the mouth cavity to the lungs. It begins on the floor of the throat and extends backward until it divides into two parts (*bronchi*) connected with the right and left lungs. In its wall are sixteen to twenty incomplete rings of cartilage to prevent collapse, and, by reason of their incompleteness, to allow the esophagus to compress them during the swallowing of food. Many small glands discharge mucus over the interior of the trachea, which, being lined with ciliated epithelium, is kept constantly moist, the current of mucus and phlegm being always away from the lungs and toward the mouth.



Human Trachea, Dividing Below into the Bronchi, at its Upper End the Laryngeal Cartilages.

Tracheot'omy, opening of the trachea by incision or puncture for the free ingress and egress of air when respiration is labored or suffocation is imminent from obstruction in the throat. The operation is chiefly demanded when the larynx is obstructed by the membrane of croup or diphtheria, is the seat of acute dropsy, is closed by foreign bodies, or is contracted by previous inflammation or ulceration.

Trachoma (trā-kō'mā), known also as Granular Lids, Egyptian Ophthalmia, etc., an inflammation of the conjunctival membrane of the eye, with the formation of "granulations" or rounded bodies, which may produce serious scars. The predisposition to trachoma includes races, the Irish, the Jews, Orientals, and American Indians being especially liable, while negroes are almost exempt. Trachoma is contagious, and a specific cause has been indicated—the trachoma coccus. The roughened lids rub over the cornea and irritate it, and if the lids become distorted by scar tissue the eyelashes rub against the eyeball, and may lead to blindness. Trachoma is a tedious disease, extending over months and even years. The treatment is directed to the absorption of the "granulations" with the least possible scar tissue. Caustics, such as silver nitrate or bluestone, are used, and the contents of the granulations may be squeezed or rubbed out. As general attention was first called to the disease by Larrey's description of the state of the eyes of the French army in Egypt in 1798, it is often called Egyptian ophthalmia. The soldiers who returned from the Egyptian campaigns are supposed to have disseminated it throughout Europe.

Trachyte (trā'kīt), a glassy rock, in chemical composition similar to syenite. Among its constituent minerals are potash-feldspar, some lime-soda-feldspar, and one or more ferromagnesian minerals—biotite, hornblende, augite. When quartz is present in small amount the rock is quartz trachyte; with increasing quartz it passes into rhyolite. Trachytes may be rough and porous, or compact and dense, or glassy; and are usually light-colored rocks, but may be any shade of gray to black. Trachytes occur in Montana, Wyoming, S. Dakota, and Colorado, but are better known in Italy, France, and Germany.

Tracta'rianism, the Anglican doctrinal and religious system promulgated in the Oxford "Tracts for the Times," 1833–41; the principles of the movement known as the Oxford Movement, and afterwards as the Catholic or Anglo-Catholic Revival. In the first quarter of the nineteenth century the principles of the Church of England were maintained with little zeal, and public worship and church edifices evidenced laxity and neglect. The first marked sign of a reaction was the appearance of John Keble's "Christian Year," and its phenomenal popularity. The publication of the "Tracts for the Times," prepared by different authors, began September 9, 1833. The first sixty-six tracts were short papers, some original, but mostly extracts from eminent Anglican writers, especially of the seventeenth century, and from Ante-Nicene fathers.

The points especially insisted on by the Tractarians in addition to apostolic succession (the grace of the sacraments, and therefore belief in baptismal regeneration, the real presence in the eucharist, and the power of the keys in absolution) were regarded by many as Romish. The entry of J. H. Newman into the Roman Catholic Church in 1845 intensified the feeling against the Tractarians, but the two greatest leaders, E. B. Pusey and John Keble, remained Anglicans. Since 1845 the Anglo-Catholic revival has assumed a more and more practical character in the institution of guilds, religious sisterhoods and brotherhoods, and parochial missions, improvement of church music, introduction or revival of hymns and popular devotions, restoration and building of churches. All the principal phases of the Tractarian and Anglo-Catholic movement have reproduced themselves in the Episcopal Church of the U. S.

Trade'-mark, a mark by which one's trade or wares are known in business. The right to use a trade-mark is not confined to a manufacturer or producer of goods. One who exercises skill and fidelity in the selection of goods, or who bleaches goods, or is a shipper, a commission merchant, a seller or a carrier, may acquire the right to a trade-mark which serves to distinguish his vendible commodities from those of others—to authenticate them as the signature authenticates a letter. A name merely descriptive of an article or of its ingredients cannot be protected, as this might give practically a monopoly of the sale of the goods. But a word or mark employed in an arbitrary or fanciful manner will be protected. Devices, symbols, or pictures may be used as trade-marks. For example, a star, an elks' head, a picture of a boy doubled up with cramps, a peculiar grouping of letters, an arbitrary combination of numerals such as 3214, may be used to individualize the goods dealt in by a particular person, and become a valid trade-mark. Ordinarily a geographical name cannot be turned into a trade-mark. If it is used in an arbitrary or fanciful sense, it may be protected, as in the case of Vienna bread, or Columbia Hotel. In the U. S., by act of Congress, trade-marks may be protected for twenty years, the protection being renewable thereafter for like periods. The Government fee is $10, and full particulars may be obtained of the Commissioner of Patents, Washington, D. C.

Trades Un'ions, societies of workingmen organized chiefly to assist members in contest with employers to secure rights and privileges. They are a natural evolution of the ancient guilds. Benefit-society features are often added, by which members are helped when out of work, sick, or disabled by accident. The common law in Great Britain down to 1825 made all labor combinations criminal, and punished them as conspiracies. Great Britain is now the stronghold of trades unionism, as in other European nations the unions easily become socialistic, and decay because they tend much to theories, unlike British unions, which are for business only. The principal efforts of the unions in the U. S. have been to raise wages, to reduce hours of labor, to regulate the labor market by limiting the number of apprentices and restricting immigration, and to obtain better conditions of labor generally. While the strike is still its strongest weapon, the unions have furthered their objects by requiring that all goods made by union workers shall bear a certain label, and requiring its members to buy none but goods so labeled.

The trades unions of the U. S. include the various railroad brotherhoods, which are "open-shop" unions, *i.e.*, its members are not forbidden to work with those who do not belong to the order. The American Federation of Labor, originating in 1887, the largest union organization in the U. S., is composed of 117 distinct unions, with 27,000 local branches. It claims a membership of 2,000,000, and has recently adopted a political programme, insisting especially upon the abolition of the use of injunctions in labor disputes. (See INJUNCTIONS.) The Knights of Labor, founded in 1869, aims at a centralized system, while the Federation of Labor wishes to leave the different trades unions with their own governments.

Trade Winds. See WIND.

Tradu'cianism, a theory held by some early Christian theologians that the human soul is derived from the souls of the parents. The prevalent view in the Roman Catholic and Protestant churches is, however, creationism —the theory that each soul is a separate creation, joined to the body just after its conception.

Trafalgar′. See Cape Trafalgar.

Trag′acanth, a gummy exudation from several shrubs of the bean family found in W. Asia. The dried gum resembles horn in appearance. It is hard, has no smell, and but little taste. It does not dissolve in water, but absorbs it, swelling up and forming a paste. Gum tragacanth is used in calico printing, and in medicine to some extent for coughs.

Trag′edy, that variety of the drama which represents the final catastrophe in the lives of characters doomed for some cause to misfortune or evil. Tragedy had its rise in Greece, and, in the ancient world, reached its highest in the works of Æschylus, Sophocles, and Euripides. The definition of Aristotle, based upon these works, is still a good description of tragedy, though it does not make an unhappy ending essential: "Tragedy is an imitation of an action that is serious, complete, and of a certain magnitude; in language embellished with each kind of artistic ornament, the several kinds being found in separate parts of the play; in the form of action, not a narrative; through pity and fear effecting the proper purgation of these passions." The first English tragedy was "Garbuduc," by Sackville and Norton, acted in 1562. Soon thereafter tragedy attained an unsurpassed grandeur in the works of Shakespeare and his contemporaries.

Trag′opan, a family of beautiful wild birds resembling in many respects the common fowls. The males, instead of a comb, have a crest of soft feathers and a pair of soft hornlike appendages, which they can move at will, above the eyes, as well as wattles in front on the throat; the tail is large. The species are mostly confined to the pine forests of the Himalayas. They dwell in the inmost recesses of the forests, and are difficult of approach. They average about the size of the domestic poultry, or perhaps are a little larger. They feed upon grain, insects, worms, etc.

Trail′ing Ar′butus. See Arbutus.

Tra′jan (Marcus Ulpius Trajanus), 53–117; Roman emperor, 98–117; b. near Seville, Spain, of Roman descent; was educated in the camp of his father, and distinguished himself so much in the Parthian and German wars that he was adopted by Nerva in 97, and in 98 succeeded him on the throne, being the first Roman emperor born out of Italy. Trajan's reign is considered, next to that of Augustus, the most brilliant of imperial Rome. By two campaigns (101–102 and 104–106) Dacia, the region comprising the present Transylvania, Moldavia, and Wallachia, was conquered. Of less permanent importance were the conquests in Armenia and Mesopotamia. Although most eminent as a general, Trajan was a vigorous and capable ruler, and the probity of his administration gave rise to the phrase with which a new emperor was first saluted—*Augusto felicior, melior Trajano* (more fortunate than Augustus, better than Trajan). Cities were founded, colonies settled, fortresses and harbors constructed, and numerous roads, canals, bridges, etc., were built throughout the empire. In Rome the Forum Trajani was constructed, containing the famous column in its center. Large sums were employed in the education of free-born Roman children. Libraries were founded, and Latin literature experienced its afterbloom in Tacitus, the younger Pliny, and Juvenal. Pliny's correspondence with Trajan gives a valuable picture of the provincial government, and throws light on the treatment of the Christians, whose relation to the empire was becoming a question of importance.

Trajan's Col′umn. See Column.

Trajan's Wall, a fortification in Roumania, nearly 50 m. long, extending from the Danube to the Black Sea. It is even now a strong line of defense. It was constructed in 377 by Trajan, a general of Valens, to prevent the Visigoths, who had crossed the Danube, from advancing farther southward.

Tram′ways. See Street Railways.

Trance, a state of abeyance of most of the vital functions, resembling in some cases a profound sleep, in others closely simulating death. Some cases of so-called trance are cataleptic, and all are associated with abnormal or perverted nerve functions. Trance sometimes follows religious excitement. In some cases of real or pretended trance the patient can speak, and even address public audiences, the condition being assumed at will. But in the more profound trance all sensibility and power of motion is lost, and in some no sign of breathing or of heart beat is apparent. This condition may last for months or even years. See Catalepsy; Coma; Fainting; Hypnotism.

Tranquil′lus Sueto′nius. See Suetonius Tranquillus.

Transcenden′talism, a term used to describe the doctrine of the New England school of philosophy, initiated by Ralph Waldo Emerson and A. Bronson Alcott, which, however, owed its origin to the study of Plato and the Neoplatonists rather than of Kant, although the latter, through Coleridge, exercised some influence. Transcendental are all those primary and original principles of knowledge which, as necessary and universal truths, underlie all particular truths derived from experience. The main idea of the transcendentalists was the supremacy of mind and matter, and the soul's supposed intuitive knowledge of things divine or human without the necessity of experience.

Transform′er, in electricity, an instrument for converting an alternating current from a higher to a lower potential, or vice versa. A step-down transformer converts a small current at a high potential to a large current at a low potential; a step-up transformer converts a large current of low potential to a small current of high potential. The energy obtained from a transformer is equal to that put in less the losses due to heating. Step-down transformers are commonly used in the ordinary systems of alternating-current distribution for the supply of incandescent lamps at constant potential. The alternating-current transformer is a modification of the old-fashioned induction coil, and consists essentially of a primary and a secondary coil of wire embracing the same magnetic circuit. The simplest form of such a transformer is shown in Fig. 1. The primary coil, commonly spoken of merely as the "primary," consists usually of many turns of fine wire. This is connected to a supply of alternating current, commonly at 1,000 or 2,000 volts. The current which flows in the primary is small, being opposed by the counter-electromotive force of self-induction, which is large on account of the fact that the primary turns are many and embrace an iron coil.

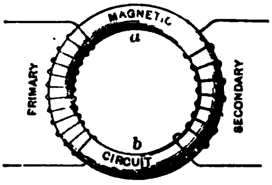


FIG. 1.

The common form of transformer distribution for lighting purposes is shown in Fig. 2. The primary mains are supplied with a potential of 1,000 volts by a constant potential alternating-current generator placed in some central station. Each house to be lighted has installed in it an individual transformer, which supplies incandescent lamps at 50 or 100 volts, but one large transformer may be used for each district or group of houses, thus entailing less first cost for transformers and a higher efficiency; for, as the output of the transformer is increased the size and cost do not increase in proportion; and, furthermore, greater efficiency is thus obtained.

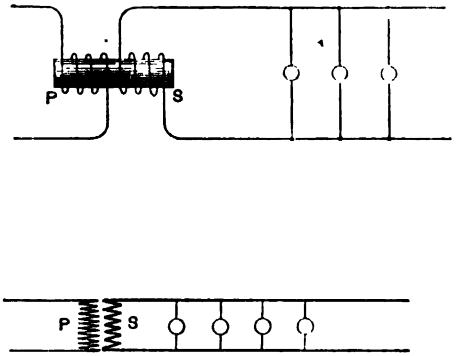


FIG. 2.

The calculation of the efficiency of the transformer consists either in the measurement of the power supplied to the primary and the power obtained from the secondary or in a determination of the several losses. The efficiency is the ratio of the secondary output to the power supplied to the primary—that is, efficiency $= W_2 \div W_1$.

Transform'ism, a political arrangement first used in Italy in 1884, by which the ministry is selected not from one party, but from several, each minister being responsible to Parliament. The result was found unsatisfactory.

Transfu'sion of Blood, a surgical operation in which blood from a strong and healthy person, or from an animal, is injected into the veins of a feeble or anæmic patient. It is especially employed after severe bleeding, great care being taken to exclude bubbles of air or clots, either of which may prove fatal. The transfusion of warm salt solutions is almost if not equally useful, and does not have the dangers of blood transfusion.

Trans'it, the passage of a planet over the disk of the sun, or of any heavenly body over an arbitrary point. The transit instrument is used to determine to the fraction of a second the time of a star's passage over the meridian. It is a telescope fixed at right angles to an axis the ends of which point E. and W., so that the telescope may be raised or lowered at any angle along the plane of the meridian. Near the eyepiece is a glass crossed by a series of very fine lines, and the time at which the star crosses these lines is recorded. See OCCULTATION; ECLIPSE.

Transits of Ve'nus and Mer'cury. As these two planets are the only ones whose orbits lie within that of the earth, they are the only ones whose passage across the disk of the sun can be observed. Transits of Mercury occur at intervals of a few years; never more than thirteen nor less than three. They have no special astronomical significance, but owing to their interest are observed when they do occur. Transits of Venus are among the rarest phenomena of astronomy, as only two occur in a period of more than a century. They were formerly believed to afford the most accurate method of determining the solar parallax (*q.v.*). So the astronomical world devoted great attention to the observation of those which occurred in 1761, 1769, 1874, and 1882, and expeditions were sent to distant points of the earth's surface to make observations. On the whole, however, they have been a failure, so far as the determination of the sun's parallax is concerned. The last transit occurred in 1882; no other will be seen until the year 2004.

Transmigra'tion of Souls, the doctrine of the repeated existence of the soul in the different forms of matter, its form in each successive existence being determined by its merits and demerits in the preceding ones. Buddha, replacing the idea of soul with the idea of Karma, denied the entire theory of transmigration. It has, however, extensive sway among the ignorant masses of his followers, in spite of his negative teaching. The most striking fact in connection with this doctrine is its wide prevalence. The ancient civilization of Egypt seems largely to have grown out of this faith. The millions of India also have, under its spell, suffered their lives, wrought their great works of government, architecture, philosophy, and poetry, meditated, aspired, and exhaled their souls. Ruder forms of it are reported among innumerable barbaric tribes. It was taught by Pythagoras and Plato. It played an important part in the speculations of the early Fathers of the Christian Church, and has often cropped out in the works of later theologians. The grounds on which this belief rests are chiefly (1) the strong resemblances, physical and psychical, connecting human beings with the lower creatures. They have senses in common with us, together with the rudiments of intelligence and will. They all seem created after one plan, as if their varieties were the modulations of a single type. We recognize kindred forms of experience and modes of expression in ourselves and in them. Now the man seems a travesty of the hog, the parrot, the ape, the hawk, or the shark; now they seem travesties of him. As we gaze at the ruminating ox, couched on the grass, it is not difficult to fancy him some ancient Brahman transmigrated to this form, and patiently awaiting his release. Nor is it incongruous with our reason or moral feeling to suppose that the cruel monsters of humanity may in a succeeding birth find the fit penalty of their crime in the horrid life of a crocodile or a serpent. (2) The idea of a series of connected lives furnishes a plausible explanation for many mysteries in our present experience. Faces previously unseen, and localities unvisited, awaken in us a feeling of familiarity. Thoughts and emotions not hitherto entertained come to us as if we had welcomed and dismissed them a thousand times. Many an experience, apparently novel and untried, makes us start as though the chambers of the soul had often before echoed to its shadowy footsteps.

(3) Much more weighty is the philosophical argument drawn from the nature of the soul. Consciousness being in its very essence the feeling of itself, the conscious soul can never feel annihilated even in thought. It only loses the knowledge of its being when it lapses into unconsciousness, as in sleep or trance. (4) But the strongest support of the theory of transmigration is the solution it seems to give to the problem of the inequality and injustice in the world. To the superficial observer the whole scene of struggle, sin and sorrow, triumph and defeat, is a maze of inconsistencies, a combination of discords. But if we believe that every soul, from that of the lowest insect to that of the highest archangel, composes an affiliated member of the family of God, and is eternal in its conscious essence, perishable only as to its evanescent disguises of incarnation; that every act of every creature is followed by its legitimate reactions; that these actions and reactions constitute a law of retribution absolutely perfect; that these souls, with all their doings and sufferings, are interconnected with one another and with the whole, all whose relationships copenetrate and coöperate, with mutual influences whose reports are infallible, and with lines of sequence that never break—then the bewildering maze becomes a vindicated plan, the horrible discord a divine harmony. But the theory of the transmigration of souls remains, to the average modern mind of the W. world, a mere fancy, although it has a deep metaphysical basis, a strong poetic charm, and a high ethical and religious quality. See Metempsychosis.

Transporta'tion. See Commerce, Interstate Commerce, Railway or Railroad, Street Railways.

Transportation. See Prison.

Transposi'tion, in music, the act of removing a composition into a key different from that in which it is written. By this is not meant a change of mode also. A piece of music written in a major key cannot be transposed into the corresponding minor (as from C major to C minor) unless its construction has been such as to make such a transfer possible. A composition in any major key may be transposed into any other major key; and the same rule applies to compositions in minor keys. Transposition is not simply the moving of all the notes of a piece one or more degrees higher or lower, for such a change would at once destroy or impair its distinctive character. A composition in C major, if carried three degrees higher—*i.e.*, into the scale of F—would be false on every fourth degree of that scale, because one of the semitones in the series differs in its position from the normal pattern in C. To rectify this, the fourth (or B) is lowered by placing at the clef a flat on that degree; and by thus changing every B into B flat the scale is corrected, and transposition from C to F requires nothing more than a change of the places of the notes.

Transubstantia'tion, the change of the substance of the bread and wine into the very body and blood of Christ in the eucharist, while the visible form and appearance of bread and wine remain. According to the Roman Catholic Church, this miracle takes place in the mass whenever the priest pronounces the words "This is my body," "This is my blood." Some Fathers of the Church—Ignatius, Justin, and Irenæus—laid stress upon the mysterious connection between the bread and wine and the divine presence. Other Fathers spoke of the elements as symbols of the body and blood of Christ. The first great controversy arose over a book by Paschasius Radbertus in 831 ("De Corpore et Sanguine Domini"), in which he held that the substance of the consecrated bread and wine was changed into the very body of Christ. Lanfranc and the schoolmen held that after consecration the bread and wine retained their sensible properties or "accidents," although their "substance" or "subject" was changed into flesh and blood. The Fourth Council of Lateran (1215) declared transubstantiation an article of faith. The reformers in the sixteenth century rejected the mass and transubstantiation, regarding the elements only as signs of remembrance of the body of Christ, which is in heaven. So strongly is transubstantiation repudiated by Protestants that the coronation oath taken by English sovereigns states elaborately a disbelief of the doctrine. See Eucharist; Host.

Transvaal', a British territory in S. Africa, originally colonized by part of the Boers who left Cape Colony in 1836 for Natal and quitted that colony on its annexation by Britain in 1845. It lies N. of the Vaal River and S. of the Limpopo, and is bounded by Rhodesia, Bechuanaland, Orange River Colony, Natal, Zululand, and Portuguese E. Africa. Area, about 120,000 sq. m.; pop. 1,347,227, of whom about 289,952 are whites. Pretoria is the seat of government; the largest town is Johannesburg. The country is elevated, forming high plateaux, and in some parts is quite rugged, mountains rising in the E. to 8,700 ft. In the S. is the famous elevated track known as the Witwatersrand. The rivers are chiefly tributaries of the Limpopo. The climate is remarkably salubrious. Minerals are abundant, especially gold, which is mined in many places, the chief being the Witwatersrand, of which Johannesburg is the center. The mining of diamonds is also an important industry, £1,972,064 being the export in 1907. The output of gold in the same year was valued at £27,364,717. Coal is abundant, and is also worked. The country is more pastoral than agricultural. In 1877 the Transvaal was annexed by Britain, the country being far from flourishing, and a certain number of the people being in favor of this step. In 1880 the Boers took up arms against the British, defeated a body of troops at Majuba Hill, and as the result recovered their independence, although with limitations and subject to the suzerainty of Great Britain. By a convention made in 1884 the relation of the state to the British crown was modified, Great Britain then retaining control of foreign affairs, and from that date till 1900 it was known as the S. African Republic. Latterly the area had been extended at the expense of the Zulus, and in 1894 Britain recognized Swaziland as a dependency of the Transvaal. A great increase of the population took place along with the extension of gold mining, from about 1886, and various railways were constructed. For some years before 1895 much discontent prevailed among the "uitlanders," or aliens—whites not admitted to citizenship—and at the end of 1895 this led to an abortive revolution at Johannesburg. Simultaneously Dr. Jameson, with an armed force belonging to the British South Africa Company, entered the Transvaal and rode toward Johannesburg, but was attacked and defeated by a body of Boers. In October, 1899, war broke out with Great Britain, the Transvaal being joined by the Orange Free State in commencing hostilities. After nearly eleven months' fighting and the occupation of the chief towns, the country was annexed by proclamation in 1900. Hostilities continued until May, 1902, when terms of peace were signed. Before the two Boer republics could be crushed Britain had placed some 200,000 men in the field under the supreme command of Lord Roberts. The President at the time of the revolt had been J. Paul Kruger, who had held the office continuously since 1883.

After the war Lord Milner assumed office as Governor of the Transvaal, and executive and legislative councils were constituted. In 1905 letters patent were issued providing for representative government, and in December, 1906, a constitution was granted by Great Britain to the colony, providing for a legislature, to consist of a legislative council, at first appointed by the governor and later to be elected, and a legislative assembly, elected in electoral divisions by the registered voters.

Transylva'nia, the SE. part of the Kingdom of Hungary. Area, 21,518 sq. m. There are fifteen counties; pop. (1890) 2,247,049, of whom about 55 per cent are Roumanian, 29 per cent Magyars and Szeklers, 10 per cent Germans, and nearly 50,000 gypsies. The country is hilly and mountainous, with a mean elevation of 1,444 ft., with the Carpathians on the E. and the Transylvanian Alps on the S. The drainage is into the Danube. The climate is mild and agreeable in the lower lands. The chief crops are maize, wheat, oats, fruits, tobacco, flax, and hemp. Wine is made in large quantities. The horses number 188,000, and the breed is excellent. Cattle are reared in large numbers, and the breeding of sheep and swine is general. Mining has been a very important industry, and Transylvania used to be called the gold mine of Europe. Gold has been obtained from time immemorial, and is produced in considerable quantities from both mines and placers. Silver and iron are also mined. Manufactures and other industries are not well developed, and are declining because of the recent political and Slavic tendencies, which are driving out the Germans. Trade is largely with Roumania, and is in the hands of Armenians and Greeks. There is a university at Klausenburg, and there are many secondary schools.

Transylvania was a part of Dacia, acquired by Trajan and colonized with Dalmatians, Gauls, and people from Roman Asia Minor. When the Roman Empire was in decay this region was especially exposed, and was occupied by race after race of the invaders—latest by the Magyars. In the twelfth century colonists were again introduced, this time from the basin of the Rhine (Teuton), and there called Saxon. The Saxons built the most of the existing cities. After the defeat of the Hungarians by the Turks at Mohacs in 1526 Transylvania was independent till 1690. After that it became a grand duchy and crown land of Austria, and so remained till 1867, when it became, politically and administratively, an integral part of the Kingdom of Hungary. See HUNGARY.

Trapani (trä'pä-nē), a seaport of Sicily. The churches contain interesting artistic objects. The celebrated sanctuary of the Madonna of Trapani (finished 1332) is outside the town. The trade is chiefly in fish, coral, sponges, wine, oil, fruits, cotton, semolino, etc. Among local industries are works in marble, alabaster, coral, and shell. Here in 249 B.C. the Carthaginians defeated the Romans in a famous naval battle. Pop. of commune (1901) 59,452.

Trap'pists, monastic order of the Roman Catholic Church, named from La Trappe, an abbey of the Cistercian order, in Normandy. Here Armand Jean le Bouthillier de Rancé in 1664 introduced those severe reforms which made the Trappists one of the most austere orders of the church. Twelve hours of the day were given to religious exercises and several hours to hard labor. Vegetables and water formed the fare; meat, wine, etc., were forbidden, and conversation between the monks themselves or with outsiders was avoided. The whole life tended to concentrate the mind on the sole idea of death. The order has been suppressed in France, Italy, and Germany; but monasteries exist in the U. S. and Canada.

Trap Rock. See BASALT.

Tread'mill, a machine first used by the Chinese to raise water for irrigation, but in 1817 adapted as an instrument of punishment, consisting of a large wheel, about 20 or 25 ft. wide, with steps on its external surface, upon which criminals are placed. They maintain themselves in an upright posture by means of a horizontal bar fixed above them, of which they keep hold, and their weight sets the wheel in motion. The power thus obtained may be applied to the same purpose as water power, steam, etc. The treadmill has recently been abandoned in most penitentiaries.

Trea'son, a crime of indefinite and variable limits against the sovereignty of the people or the person of the supreme ruler. The Romans call this crime *perduellio,* and afterwards *crimen majestatis*—that is, either hostility to one's own country, such as joining its enemies in war, or hostile attack on the emperor, or the act of invading the sovereignty of the people. In the expression, *lædere majestatem,* to injure the sovereignty of the people or of the state, is found the origin of the term, *lèse-majesté,* used by the French to denote treason. The English definition of treason or high treason has included, especially, compassing or imagining the death of the reigning sovereign or his (or her) eldest son and heir; violation of the queen or the king's eldest daughter, being unmarried, or his eldest son's wife; levying war against the sovereign within the realm by a subject; giving aid and comfort in or outside of the realm to the sovereign's enemies; counterfeiting the great or privy seal; importing "false money, counterfeit to the king's money," besides other offenses which at any time of excitement it seemed best to comprehend under the same term. The folly of such legislation led to the simple definition of the U. S. Constitution that "treason shall consist only in levying war against the U. S. or in adhering to their enemies, giving them aid and comfort." It is implied that the crime can be committed only by one owing allegiance to the U. S.

The states of the Union, to some extent at least, have admitted into their codes a crime of treason against themselves similar to that committed against the U. S. For, if an invading force from a foreign country should land on the territory of a state and be joined by one of its citizens, he would be amenable to the laws of the U. S.; if it were joined by a man from one of the other states, the same would be true, but in this case the state could not try him for treason, as he is in no sense its subject. A general law against seditious or armed assemblages would answer all purposes, and could not come into conflict with the laws of the Union. On the other hand, if a man were acquitted of treason against a state, he would still be liable to indictment for treason against the U. S. for the same offense.

Treas'ure-trove, in common law, accidentally found gold or silver coin, plate, or bullion which had been hidden in the earth or in some secret spot so long ago that its existence was forgotten and its owner unknown. Such property technically belonged to the crown, unless the owner were found. In the U. S. the term is not much used.

Treas'ury of the Unit'ed States, a department of the executive government of the U. S., having control over the collection, management, and disbursement of the public revenue, and presided over by a secretary, who is, next to the Secretary of State, the most important officer of the Cabinet. The present office dates from the law of September 2, 1789, drawn up with such precision and comprehensiveness by Alexander Hamilton, the first secretary, that few changes have since been made in its language.

Trea'ties, compacts or agreements made by two or more nations or sovereigns. States, like individuals, may make contracts. These rest for their fulfillment upon the good faith of the contracting parties. A state must have capacity to contract. This is lacking to the individual states which compose the U. S., being denied them by its Constitution, but may belong to the members of a more loosely organized confederation. It is lacking also in its fullest extent in a state like Belgium, which, under its status of neutrality, has no right of making war save in self-defense, and is thereby debarred from such treaties as alliances which imply the ability to wage war. The agents negotiating a treaty must be properly authorized to make their agreement a valid one. This is a constitutional question which each state must answer for itself.

There must be freedom of consent on the part of the negotiators. Duress or intimidation, false representation, bribery, applied to the treaty agent and instrumental in deciding the terms of agreement, will invalidate it. But a mere mistake as to the value of a consideration will not matter. Thus, before the thorough exploration of the Mississippi River, the right of free navigation from British territory upon its whole course, a valueless concession, was agreed upon by treaty in return for valuable fishery privileges. Where the existence of a nation is at stake it is held that no agents are competent to transfer it by treaty, and yet the partition of Poland has been an accepted fact for a century. Again, treaties are void which involve a violation of accepted principles of international law, which contain stipulations whose execution has become impossible, or which conflict with prior obligations to a third power. For instance, an agreement to engage in the slave trade or to assert joint control over a portion of the high seas would be invalid. The language employed in treaties was anciently Latin, then French, as that became the language of diplomacy. A distinction of small importance is made between treaties and conventions, the former having generally a wider political scope, while the latter relate to some minor specific object. For instance, the Treaty of Washington of 1871 was followed by the convention of 1873 settling the place where the sessions called for by its twelfth article should be held.

Ratification of a treaty is expected, and necessary to make it valid. Under a Constitution like that of the U. S., where the power of making treaties belongs to the President, while the Senate must confirm or veto (by a two-thirds vote), knowledge of this fact is presumed, and notice that ratification is necessary is not required. It was formerly held that, if the agent who made the treaty proceeded according to his *full power* but not according to secret instructions, the principal was bound by his action, since the full power, being known to the other party, was the motive in consideration of which he consented to treat. But at present it is held by the best authorities that the principal may withhold his ratification, in certain circumstances, even when the negotiator has followed his private instructions. The refusal is justified in cases like these (see Wheaton, iii, ch. ii, sec. 256–263): (1) "On the ground of the impossibility, physical or moral, of fulfilling the stipulations"; (2) "on the ground of mutual error of the parties respecting a matter of fact, which, if it had been known in its true circumstances, would have prevented the conclusion of the treaty"; (3) on the ground of "a change of circumstances on which the validity of the treaty is made to depend, either by an express stipulation or by the nature of the treaty itself."

In the U. S., if the payment of a sum of money forms one of the conditions of a treaty, a majority of the House of Representatives must concur. In this way it would be possible, in certain cases, to defeat the action of the Senate; but to do this, except in extreme cases, would oppose the spirit of the Constitution, which evidently intended to invest the President and Senate finally and absolutely with the treaty-making power.

Of special classes of treaties, the most common are alliances and treaties of guaranty. An offensive alliance is an anomaly, except when made with reference to a particular war. A defensive alliance was made in 1778 between France and the American confederated colonies during the Revolution. A modern example is the Triple Alliance of Germany, Austria, and Italy. An alliance both offensive and defensive binds states together in the strongest way possible short of confederation. In treaties of guaranty the thing guaranteed may be a particular status, as of neutrality; or the integrity of another treaty or of specific rights under it; or the protection of certain property or territory, as when by Treaty of 1778 with France the U. S. guaranteed the French possessions in N. America. With this object, hostages were formerly given, but not by present usage, except in military conventions, the last instance being in 1748 to secure the Treaty of Aix-la-Chapelle. Solemn oaths to observe a treaty are also out of date. Pledges are still in use. Thus certain French fortresses were left in German hands after 1871, for several years, to secure the carrying out of the terms of the treaty of peace, an enormous money indemnity being one of them. Lastly, may be mentioned the guaranty of a treaty by a third power.

When a treaty is made to secure a definite object, and that object is attained, the treaty has no longer any reason for existence. Many treaties are of this class, to settle a boundary, to arrange for the arbitration of a special difficulty, to satisfy certain claims. A treaty is an entire contract, and if one article is violated, the injured party may consider the whole void or may, if it prefers, insist on the enforcement of the remaining articles. Treaties of peace, of commerce, of alliance—of all, in fact, where friendship is an essential basis—are terminated by war. On the other hand, many treaties are by nature or in terms perpetual, like the recognition of our independence within certain boundaries by Great Britain, or the Fishery Treaty of 1818 agreeing that the inhabitants of the U. S. "shall have forever . . . the liberty to take fish" on certain coasts. Moreover, all those treaties which contemplate a state of war must survive, such as treaties laying down the rules of blockade, contraband, convoy, visitation, capture, and so on. It may be added that private rights, resulting from rules of admitted justice, are not extinguished by a war; and so a debt due by one nation to another, where the same rules of right prevail as are acknowledged in municipal law, survives a war.

The only rational object of war is to secure a state of justice involving reparation and security for the future. Treaties of peace indicate memorable changes of relative strength, or mark a new policy, or bring in a new dynasty, or are in some way the eras of some kind of progress. They are the hands of a clock, but the war was the moving force. Treaties of peace are subject to the same rules of interpretation with others made by the constitutional power in the state. When do treaties go into effect? They bind the parties when they are signed or when they are ratified. They bind individuals when they receive news that such treaties have been made. The effect of peace is to put an end not only to a war, but also to all complaints relating to the subject for which war was undertaken. It is an oblivion or amnesty of all past difficulties. A new war can be undertaken for similar causes of complaint, but not for the same. They are forgotten and forgiven, whether mentioned in the treaty or passed over in silence. Territory stays in the actual occupant's hands unless passed over by express agreement, and a strong place must be restored without injury to its works. When a part of a country is yielded up at peace to the enemy, the former sovereign is neither bound to make compensation to those who suffer by the change of jurisdiction, nor to secure the new sovereign against resistance from the inhabitants to his authority. All he does is to renounce his own sovereignty and jurisdiction. For particular treaties, see under the name of the treaty.

Treb'izond (formally called TARABOZAN), town in Asia Minor; on the SE. coast of the Black Sea. It is the Turkish terminus of the main route to Armenia and Persia, but the trade formerly centering here is being diverted to Batoum. The imports are mainly manufactured European goods. The exports are wool, mohair, skins, wax, gum, resin, gall-nuts, tobacco, oil, opium, fruit, shawls, and carpets, brought by camel caravans; also timber and boxwood. Trebizond gave a memorable reception to the Ten Thousand. Trajan made it the capital of Pontus-Cappadocia. In 1204 Alexius Comnenus founded the empire of Trebizond, which lasted till 1461. Pop. abt. 35,000.

Treb'le, in music, the highest vocal or instrumental part in a concerted piece, such as is sung by women or boys, or played by instruments of acute tone, as the violin, flute, oboe, clarinet, etc., or on the higher keys of the piano, organ, etc., so called because it was originally a third part added to the ancient *canto fermo* and the counterpoint.

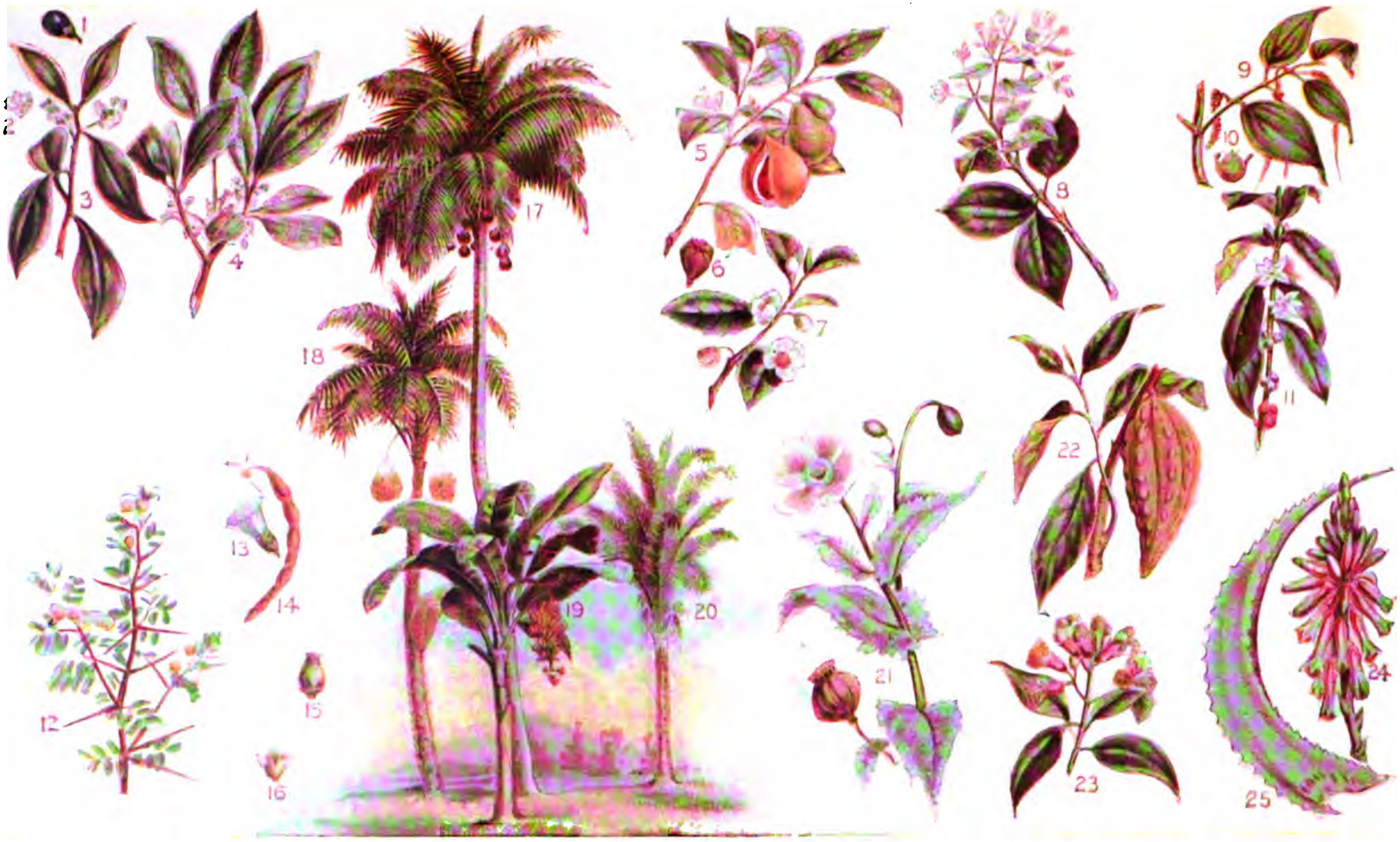
Tree, a woody plant with a single trunk rising to more than the height of a man. There are all gradations between shrubs and trees. Most common trees increase in thickness by the addition each year of a cylinder of wood around the wood of the preceding years. They are said to be exogenous in growth. The seedling stem, almost as soon as it is formed, is crossed by woody threads, so arranged as to surround a central portion that remains destitute of woody matter; and these increase in size and number until they form a layer of wood (in cross-section a ring) between the soft central core, the pith, and an outer portion, the bark. When this layer of wood is formed, no additions are made to its inner portion, but new wood may continue to be formed on its outer surface, between it and the bark, all through the season. When, after a suspension of growth in winter, a second season of growth supervenes, a new layer of wood is formed outside the old one, and so on year after year. So the section of an exogenous tree trunk shows concentric layers—in all ordinary cases one for each year—the oldest next the pith, the youngest next the bark. Radiating plates—in the cross-section lines more or less conspicuous—traverse this layer of wood from the pith to the bark, dividing it into wedges; these are the medullary rays, or silver grain. Between the bark and the wood is a thin zone of cells, called the cambium, from which are developed on the one side additions to the wood, on the other to the bark. The bark is subject to distention from within, from the increasing size of the woody cylinder. The older and outer bark is consequently sooner or later fissured and riven as well as worn and weathered by exposure to the elements.

The character of the tree depends much upon its mode of branching, and this primarily upon the arrangement of leaves upon the twigs; for the branches of the spray proceed from lateral buds, of which there is usually a single one in the axil of each leaf. Palm trees are the more common type in which the stems do not increase in thickness. They rise by a simple trunk, not tapering as it ascends, terminated with a crown of large and long-stalked leaves. This simple and mainly cylindrical trunk comes from their whole vegetation being the development of a single terminal bud. The center sometimes remains pithy, as it were, and sparsely traversed by threads of wood, but in many palm stems nearly the whole becomes so closely packed with woody bundles as to form a hard wood. On account of this structure such trees have been called endogenous, "inside growing." Palm trunks soon become incapable of further enlargement, except in height. In place of a bark, distinct, separable, and of different layers, they are invested by an inseparable and permanent rind, which, along with the more solidified wood of the circumference, restricts distention.

Trees require much of moisture, and accordingly of rainfall, either through the year or through a growing season. An ordinary tree expands a large extent of evaporating surface, chiefly in its foliage. Leaves dry up and perish if not supplied with moisture to replace that which is evaporated. Therefore, not only are rainless districts treeless (except as water is supplied by irrigation), but regions of scanty summer rain are sparsely wooded or without forest. Broad-leaved evergreens abound where rains fall throughout the year, and especially where winter is unknown. Narrow-leaved or needle-leaved evergreen trees are chiefly in cooler climates well supplied with moisture. Trees with expanded foliage survive the rainless hot season of tropical regions only by dropping their leaves, upon which the stress first comes, and thereby reducing the evaporating surface. Those which retain their foliage are such as have some peculiar provision—by thickened skin or tough structure, to which, especially in Australia, is sometimes added a vertical instead of horizontal position of the leaves, which thus present their edges instead of one face to the high sun. This prevails among the Australian acacias and myrtles. In climates in which vegetable growth and action are arrested by winter, the trees are nearly all deciduous, except the piny evergreens, the leaves of which are peculiarly organized for resisting cold.

An exogenous tree, renewing annually its twigs and foliage above, its growth of roots beneath, and zone of new wood and bark connecting the two, has no definite limits to its existence. Increase of size, height, or spread of branches, and other inevitable consequences of age, however, bring increasing, and at length inevitable, disadvantages and liabilities, so that practically most trees, like most men, die an accidental death. Exogenous trees are known, by the actual counting of their layers, to have attained the age of from 1,200 to fully 2,000 years; it is probable that some extant trees are considerably older. The tallest trees known rise little less than 500 ft. (*Eucalyptus*, in Australia). The largest in girth are trees of *Eucalyptus*, up to 81 ft.; giant redwoods, in California, up to 91, and possibly 100 ft.; boab trees of Senegal, some of which have reached the latter circumference, but they are low trees of rapid growth even when old, and probably of no extreme age; and, finally, there is a Mexican *Taxodium* or bald cypress, a slow-growing tree, which measures 112 ft. in circumference. If this does not consist of two or more original trunks which have grown into one—of which there are no external indications—it is probably the oldest existing tree known. See BOTANY; DECIDUOUS TREES; EVERGREENS.

TREES AND PLANTS OF COMMERCE.



1. Camphor Fruit
2. Camphor Blossom
3. Camphor Plant, Leaves and Flower
4. India Rubber Plant, Leaves and Flower
5. Nutmeg Plant
6. Tea Seed Vessel
7. Tea Plant
8. Peruvian Bark Plant
9. Pepper Plant
10. Pepper Seed Vessel
11. Coffee Plant
12. Gum Arabic Tree
13. Gum Arabic Blossom
14. Gum Arabic Fruit
15. India Rubber Fruit
16. India Rubber Flower
17. Cocoanut Palm
18. Date Palm
19. Banana Tree
20. Sago Palm
21. Poppy
22. Cocoa Plant
23. Clove Plant
24. Aloes Blossom
25. Aloes Leaf

N 10 U

Tree Frogs, or **Tree Toads,** a class of frogs which, by means of a round enlargement of the tip of each toe, are able to climb trees, where they feed upon insects. They are said to be particularly noisy at the approach of rain. In winter they bury themselves in the mud of pools, and in the spring deposit their eggs in the water. Of the N. American species, the *Hyla squirella*, about 1¼ in. long, is of a brownish or gray color.

Tre'foil. See CLOVER.

Trelaw'ney, Edward John, 1792–1881; English author and soldier of fortune; known especially as the author of a novel, in great part autobiographical, "Adventures of a Younger Son," and "Recollections of Shelley and Byron," reissued as "Records of Byron, Shelley, and the Author." In 1823 he joined Byron in Greece and fought in the Greek war of liberation.

Tremato'dea, a group of parasitic flatworms in which parasitism has produced but slight degeneration. The body is usually flattened, lacks cilia and all traces of segmentation; the mouth is anterior and communicates with a digestive tract which forks after a short extent. Upon the lower surface are one, two, or more suckers for adhesion to the host, and sometimes these are reënforced by hooks. Like all flatworms, they lack a body cavity and distinct circulatory organs, while the excretory system is well developed. Most species have the sexes separate.

Trem'ulous Pop'lar. See ASPEN.

Trench, Richard Chenevix, 1807–86; Irish archbishop and author; b. in Dublin; educated at Trinity College, Cambridge, and graduated 1829; spent some years in travel; took orders in the Church of England, 1833; curate and rector, 1833–45; appointed examining chaplain to the Bishop of Oxford, 1845; Hulsean lecturer, 1845–46; Prof. of Theology at King's College, London, 1846–58; Dean of Westminster, 1856–63, and ordained Archbishop of Dublin, 1864; resigned, 1884. In the field of philology he achieved distinction, and his paper on the "Deficiencies in Our English Dictionaries" gave the first impulse to the great New English Dictionary, edited by Dr. James A. H. Murray.

Trent, a river of England. It rises in Biddulph Moor, in Staffordshire, at 600 ft. above the sea level, flows SE., and forms the Humber after joining the Ouse, 15 m. W. of Hull. Its length is about 150 m., and it is navigable for about two thirds of its course.

Trent Affair', the seizure of the Confederates Slidell and Mason on board the British steamer *Trent* in 1861, and the resulting international complications.

Trent, Coun'cil of (*concilium Tridentinum*), the nineteenth ecumenical council, according to the Roman Catholic Church. Paul III convoked it for November 1, 1542, but it did not open till December 13, 1545. The objects of the council were to effect a reformation of the church, to define more explicitly the impugned doctrines of the church, and, if possible, to induce the Protestants to return to the old faith. The Protestants, including Queen Elizabeth of England, were invited to attend, but they refused. In the fourth session (April 8, 1546) tradition was declared to be equally with the Bible a rule of faith; the Apocrypha of the Old Testament were included in the Biblical canon; the Vulgate was proclaimed to be the authentic version of the Bible, and the church its only legitimate interpreter. An adjournment to Bologna on account of the plague took place, March 11, 1547. On April 28, 1552, on account of the war of the Protestant princes with Charles V, the sessions were again suspended, till January 18, 1562. Decrees were adopted ordering an index of prohibited books to be made, and defining the doctrines of the mass, ordination, the hierarchy, marriage, celibacy, purgatory, the veneration of saints, relics, and images, monastic vows, indulgences, and fasting and abstinence. Several "reformatory" decrees were also passed.

The council closed on December 4, 1563, at its twenty-fifth public session. The decrees were signed by 255 members, and were confirmed by Pius IV, who reserved to himself and his successors the right of explaining obscure or controverted points. Its results inaugurated a counter reformation, personified in men like St. Charles Borromeo and St. Francis de Sales, and unified Catholics throughout the world.

Trente-et-Un (trănt'-ā-ŭñ). See ROUGE-ET-NOIR.

Tren'ton, capital of N. J., on the Delaware River, at the head of navigation; 33 m. NE. of Philadelphia. Here are the state school for deaf-mutes, state prison, insane asylum, and industrial school for girls. The Odd Fellows' Home is near the city line. The Widows' and Single Women's Home, near the State House, was formerly the barracks used during the French and Indian War. Trenton is the seat of a Protestant Episcopal and Roman Catholic bishopric. The first public school in the state was at Trenton. Besides common schools and a high school, Trenton contains the State Normal and Model School, the Franciscan Convent of Minor Conventuals, the Union Industrial Home, and many private schools. Trenton is preëminently a manufacturing city; potteries making all classes of ware from drain pipe to china, tile companies, and many brickyards comprise an industry which gives the NE. portion of the city (old Millham) the name Staffordshire of America. Iron and steel works, woolen mills, flouring mills, rubber and oilcloth works, and a large brewery are other representative establishments. Here also are the great wire works of the Roeblings, builders of the Brooklyn Bridge.

Trenton's site attracted settlers as early as 1679, when the place was called "Yᵉ ffalles of yᵉ De La Ware," from the rifts of rock in front of the town. Mahlon Stacy and other members of the Society of Friends purchased land, and Stacy built on the Assanpink in 1680, the second flour mill in W. Jersey. About 1715 Judge Trent bought a large plantation, and the place came to be called Trent Town

(Trenton). A royal charter created Trenton a borough town about the middle of the eighteenth century, but the plan was soon abandoned. The legislature often met here before Trenton became the state capital (1790). In 1792 the town was incorporated. The Continental Congress once met here after the Revolutionary War, and a project to have Trenton made the capital of the U. S. was defeated by state jealousies. Here the battle was fought which perhaps turned the tide of the Revolution. On the morning of December 25, 1776, Washington, with about 2,500 men, crossed the Delaware from Pennsylvania about 8 m. above Trenton, and after a forced march surprised Col. Rall, the Hessian commander, and captured his entire force. This was followed by the battle of Princeton, January 3, 1777. A shaft in Monument Park at the old Five Points commemorates the event. Pop. (1910) est. at 100,000.

Trepang'. See BÊCHE-DE-MER; HOLOTHURIAN.

Trepan'ning, or **Trephin'ing,** removing a round piece of bone from the skull by using the trepan, or trephine. The modern trephine has a slightly conical body and burred, cutting sides. A center pin acts as a pivot to steady the motion while the trephine is started, but the pin is slid back into the shaft before the trephine enters the skull. In ancient times trepanning the skull was recklessly practiced, especially by quacks, for every fancied brain disease. It is now used to relieve depressed fractures of the skull, to remove clots or tumors, and to remove and drain abscesses of the brain.

Tres'pass, an unlawful act done to the person or property of another by means of direct violence, actual or constructive. The essential feature of this wrong is the direct violence, which may be actual, as in the case of an assault and battery, or constructive, as in the case of an unauthorized entry upon the land of another, and doing thereby mere nominal damage. Trespasses are separated into three classes—to person, to personal property, and to real property. The principal trespasses to the person are assault and battery and false imprisonment. Trespass to personal property may consist either in forcible direct injury to the chattel, or in taking and carrying it away from the custody of its owner. Trespass to real property is an unlawful entry upon the land of another. The commission of a legal act in an illegal manner may be a trespass, for it is the law that if one begins to do a legal act in a proper manner, and then in its further prosecution is guilty of wrongs which amount to a trespass, he thereby becomes a trespasser from the beginning. The remedy in all cases of trespass is the recovery of damages by the injured party; and if the wrong was willful, malicious, and without excusing circumstances, exemplary or punitive damages may be added.

Trevel'yan, Sir George Otto, 1838– ; English statesman and author; nephew of Lord Macaulay; b. Rothley Temple, Leicestershire, England; educated at Harrow and Trinity College, Cambridge; entered the E. Indian civil service; elected to Parliament from Tynemouth as a Liberal, 1865; Civil Lord of the Admiralty under Gladstone, December, 1868, but resigned, July, 1870. He was Secretary for Scotland, 1885–86, and again from 1892–95. Among his writings are "Letters of a Competition Wallah," "The Life of Lord Macaulay," "The Early History of Charles James Fox," "The American Revolution."

Treves (trēvz), **Sir Frederick,** 1853– ; English surgeon, b. Dorchester; lecturer on surgery, London Hospital; in 1900, consulting surgeon to the army in S. Africa; Sergeant Surgeon to the King since 1901; in 1905, elected Lord Rector, Aberdeen Univ. Wrote "The Other Side of the Lantern," "Tale of a Field Hospital," "Cradle of the Deep," etc.

Treves (German, TRIER), town of Rhenish Prussia; on the Moselle, 69 m. SW. of Coblentz. Its cathedral contains the "Holy Coat of Treves," (*q.v.*). Treves is the most ancient city of Germany (a fabulous Latin inscription says it was built before Rome), and, though decayed, is of interest from its numerous Roman remains. Pop. (1900) 43,506.

Tri'al, the formal judicial examination and decision of the issues, whether of law or fact, pending between the parties to an action, preliminary to the judgment which determines the rights and liabilities of the litigants. Though formerly all legal actions were ordinarily tried before a jury, recent legislation, both in England and the U. S., has provided that by the consent of the parties, and in some cases without their consent, the jury may be dispensed with and the issues submitted to the court or to a referee; but since the only difference between the proceedings before a court or referee and those before a jury is that in a jury trial there are certain additional details, *viz.*, the selection of the jurors, the judge's charge to them, and their verdict, these three modes of trial (before a jury, judge, or referee) may be described together.

After a cause has been called and is ready for trial, the jury is drawn and impaneled. From all the names of the jurors, written upon slips of paper and deposited in a box, the clerk draws at random the names of twelve who are to act in the case. Either party may challenge the person and proceed to ascertain whether for any reason he is incompetent to sit as a juror in that cause, the qualifications for jury duty being usually fixed by statute and referring to residence, political status, prejudice or liability to bias, mental condition, property, etc.; and a stricter rule of qualification is applied in criminal than civil cases. Besides such challenges for cause, in criminal trials the accused, and in many states the prosecution, are allowed peremptory challenges; that is, they may exclude a certain number of the jurors drawn without giving any reason therefor.

When the twelve men have been obtained they are sworn by the clerk to render a true verdict according to law and the evidence given. The counsel for the party holding the affirmative, usually the plaintiff, then briefly explains the nature of his client's claim, and examines his witnesses, who are then cross-examined by his opponent, and sometimes re-examined directly. The opposite party then proceeds in the same manner to state and prove his version of the case. At the close of the plaintiff's evidence the defendant may move for a non-suit; and if in the opinion of the court no cause for action has been shown, even assuming the truth of all the facts stated by the witnesses, the motion will be granted and the case dismissed. On the other hand, a verdict may be directed for the plaintiff if his right to it clearly appears from uncontradicted proof, but this seldom happens, there being usually a conflict of evidence which must be submitted to the judgment of a jury. The court entirely regulates the admission of evidence, and either party may except to its rulings of what facts are competent and what are not competent, to be proved, and what questions are proper and what improper, and the points of law thus raised are examined upon appeal.

When the evidence is all in, the counsel address the jury on behalf of their clients. Next comes the judge's charge to the jury. This charge is in many states restricted by statute to a simple statement of the legal rules, and in several of them it must be in writing; but at common law the judge may comment upon the facts, and may even express an opinion, provided the jury is left free to decide. Either party may request particular instructions to be given, and may except to the charge, or a portion thereof, or to a refusal to charge as requested, such exceptions presenting questions of law for review by the appellate court. After they have been charged, the jury retire to a private room to determine upon their verdict, which must be unanimous. After the jurors have retired to consider their verdict, they are not allowed to separate till it is found and upon a verdict the court may, in most cases after the finding of a sealed verdict. When they have agreed, they return into court, announce their verdict, and it is recorded by the clerk in his minutes. If they cannot agree upon a verdict the court may, in most cases, at least, dismiss them after a reasonable time. If at any time in the trial of a cause it becomes necessary to discharge a jury because of the serious illness or the insanity of one of its members, or because the jury cannot agree upon a verdict, the discharge has been held, in the majority of cases, not to constitute a bar to a second prosecution. When the trial is before the court or a referee, instead of a verdict, a written finding is filed by the judge or referee containing his conclusions of fact and of law.

The general rules of evidence are the same in criminal as in civil cases, *i.e.*, the best evidence must be given. The court decides as to the admissibility of evidence, but it is the peculiar province of the jury to pass upon the weight of evidence and the credibility of witnesses. (See EVIDENCE.) The original practice in chancery was for witnesses to be examined privately, without the presence of counsel, by an examiner or one or more commissioners appointed by the court. The examination was conducted by means of written questions and cross questions, prepared by the counsel for the respective parties or by the court itself, and the testimony was kept secret till all the witnesses had been examined. The reading of the depositions thus obtained, and of the pleadings, together with the arguments of counsel, constituted the trial, and the chancellor then gave his decision. The great objection to this practice was that till publication of the testimony each party was left in ignorance of what facts his opponent would attempt to establish, so that in most states the methods and proceedings in the trial of an equity suit have been made the same as those in a legal action before a judge or referee. The testimony of witnesses is reduced to writing, and a transcript of all proceedings preserved by official stenographers. See ACTION; CASE; GRAND JURY.

Tri'angle, a surface bounded by three sides, and consequently having three angles. A plane triangle is a plane surface bounded by three straight lines. These lines are called *sides*, and the points at which the sides meet are called *vertices* of the triangle. When classified with respect to their sides, we have: *scalene* triangles, in which no two sides are equal, and *isosceles* triangles, in which two of the sides are equal; the *equilateral* triangle has all of the sides equal. When classified with respect to angles, we have: *right-angled* triangles, which have one right angle, and *oblique-angled* triangles, in which all of the angles are oblique; triangles of the latter class may be *acute-angled* triangles, all of whose angles are acute, or *obtuse-angled* triangles, each of which has one obtuse angle. The sides and the angles of a triangle are called *elements*; the side on which it is supposed to stand is termed the *base*; and the vertex of the opposite angle is then called a *vertex* of the triangle; the distance from the vertex to the base is the *altitude* of the triangle. The area of a triangle is equal to the product of its base by half its altitude, and its three angles are together equal to two right angles, or 180°. A spherical triangle is a spherical surface bounded by arcs of three great circles.

Triangula'tion, the operation of determining the relative positions of points by means of measured base lines and angles. A precise triangulation is essential for the accuracy of a survey covering a large area. The base line, rarely more than 10 m. long, is measured with precision by special apparatus. This is connected through a series of triangles with the stations whose positions are to be determined, and all the angles being carefully measured, the data are at hand for computing the distances, directions, and differences of latitude and longitude. See COAST AND GEODETIC SURVEY.

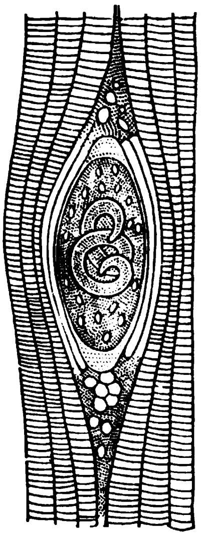
Trias'sic Pe'riod, the division of geologic time following the Carboniferous and preceding the Jurassic. The U. S. Geological Survey, in the publication of its atlas of the U. S., substitutes a single period, the Jura-Trias, for the Triassic and Jurassic periods of the European chronology.

Tribe, originally a third part of the Roman people—one of the three tribes that founded Rome; hence in historical literature a name for a subdivision of a nation or stock not yet organized as a civil state; hence, further, in sociology and ethnology a name for any union of hordes or clans which is a subdivision of a folk.

No ethnographic term has been more often used by historians, travelers, and missionaries than "tribe," and none has been used more unintelligently. As a rule, it is hard to determine whether a writer means by "tribe" a horde, a village, a clan or gens, or a nation. A horde is an aggregation of four or five to twenty or thirty simple families—each family consisting of father, mother, and children. The horde is found only among the lowest savages, such as the Australian Blackfellows, the Bushmen of S. Africa, the Fuegians of S. America, and the Arctic Highlanders of N. Greenland, or as a degenerate form in civil communities. It has no political organization. A totem kin (see TOTEMISM), clan, or gens is a group of real or nominal kindred, claiming descent from a common ancestor and tracing relationship through mother names (metronymic) or through father names (patronymic), but never through both, and usually forbidding marriages between men and women of the same gentile name. A phratry is a union or brotherhood of clans which is not an independent tribe, but only a subdivision of one. A tribe is a union of hordes under the leadership of a chief for common defense or common aggression, or it is a similar union of clans or of phratries. A tribe always claims a certain territorial region as its domain. A nation, in the ethnic as distinguished from the civic sense of the word, is a federation of tribes which speak dialects of a common language, which have a common culture, and which are crossed by the same clan lines. The nation is essentially a political organization; the tribe is essentially a military organization; the phratry is a religious organization; the clan or gens is a juridical organization; the family is an economic organization. See CLAN.

Trib'une, in Roman history, an officer, originally chosen by the people to protect them from the patricians. When the plebeians were finally admitted to the higher offices, the tribunes continued to exist, but then represented the whole people. They had a general power of arrest and, later, of fining; their persons were inviolate, and he who offered violence to a tribune could be slain without trial. They gradually acquired the right to veto the acts of magistrates or the senate. The six military tribunes of each legion were officers who stood below the commander in chief and above the centurions. In the Middle Ages the title of tribune occasionally reappeared, usually connected, as in the case of Rienzi, with the leadership of the people against the feudal nobles.

Trichina (trĭ-kī'nă), a genus of parasitic worms, the only species of which (*Trichina spiralis*) has acquired great prominence as, possibly, the most dangerous parasite of man. Besides man, it inhabits rats, swine, and some other animals. Usually, when found it is in the encysted stage, occurring in the voluntary muscles, inclosed in a spindle-shaped capsule. Inside this capsule occurs the immature worm coiled in a spiral, to which the specific name alludes. The cysts are about $\frac{1}{80}$th of an inch in length and $\frac{1}{100}$th in diameter. In the cyst it exhibits but slight motion, but its vitality is very great, living worms having been found in man eighteen years after infection. When flesh containing encysted worms is taken into the alimentary canal, the flesh and cysts are dissolved by the digestive fluids and the immature worms are set free. In the intestine they rapidly increase in size and attain sexual maturity, the male then measuring 1.5 mm. in length, the female 3 to 3.5 mm. The greater size of the female is due in part to the number of eggs and embryos, a single female giving rise to 1,500 to 2,000 living young. These embryos, scarcely 0.1 mm. in length, bore through the intestinal walls and rapidly make their way to the voluntary muscles, either by boring to them or by entering the blood or lymph vessels, and by being carried by the circulating fluids. In the muscles they become encysted, as did their parents, and they cannot become mature until freed of the cyst by the digestive juices of some animal.



A TRICHINA ENCYSTED IN HUMAN MUSCLE (ENLARGED).

This migration of the young from the intestine to the muscles produces serious and even fatal results in both man and other animals. When the parasites are comparatively few in number recovery usually follows, but when they are numerous, severe illness—trichinosis—follows, characterized by many of the symptoms of lead poisoning. First, there are intestinal pains, vomiting, and diarrhea, then pain in the limbs and muscles accompanied by dropsical swelling. Death may ensue in two days owing to the intestinal disturbances. More frequently it occurs in the fifth or sixth week. If the person survive that period the chances for recovery are increased. In bad cases of infection the number of worms is almost beyond belief, 90,000 having been found in a cubic inch of muscle in the shoulder of a man who died from trichinosis. With man the source of the infection is almost invariably from eating raw or imperfectly cooked pork in which are the encysted worms. It is only the lean meat which is dangerous, as rarely, if ever, are the *Trichinæ* found in the fat. The presence of the cysts in the pork cannot be recognized by the naked eye. None of the processes—pickling, smoking, etc.—used for preserving pork kills the parasites, and ham and bacon, unless thoroughly cooked, are as dangerous as fresh pork. In the U. S. cases of trichinosis are comparatively rare, one of the most serious being at Marshalltown, Ia., in 1891, which resulted in several deaths.

Trichini'asis, or **Trichino'sis**, the disease induced by eating trichinous flesh of swine. See TRICHINA.

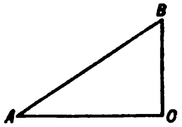
Tri'color, the French national flag, colored blue, white, and red in vertical divisions, the blue being next the flagstaff. It was first adopted during the Revolution, and it is stated, (though not generally believed) that the colors of the livery of Philippe, Duke of Orleans (Citizen Egalité), were selected for the national flag. Many other national flags are tricolors, as the Dutch, in which the divisions are horizontal instead of vertical.

Trieste (trē-ĕs'tā), formerly TRIEST, city of the Austrian Empire, and its most important port; on the Gulf of Triest, at the NE. extremity of the Adriatic, 370 m. SSW. of Vienna. The old town, which mostly consists of narrow and tortuous streets, is built on a steep acclivity, at the foot of which the new town extends along the harbor; between the two parts of the town runs the Corso, a broad thoroughfare, opening into large squares lined with magnificent edifices. Shipbuilding is an important industry. White lead, candles, wax, soap, leather, spirits, and earthenware are made. It is from its commerce that Trieste derives its importance. In 1906, 9,462 vessels of 3,082,879 tons entered the port. The value of the annual imports is about $66,000,000; exports about $62,000,000. The city has a naval and mercantile academy and a school of navigation, and is the headquarters of the Austrian Lloyds Steam-packet Company, which has magnificent docks and arsenals. Among the principal exports are grain, rice, wine, oil, flax, hemp, tobacco, silk, iron, lead, copper, and liqueurs. Cotton, cotton goods, dried fruits, etc., are imported. The old town contains a cathedral built between the fifth and fourteenth centuries. Trieste was acquired by Austria in 1382. Pop. (1907) 205,136.

Trig'lidæ, a family of fishes, related to the *Cottidæ*, including gurnards, sea robins, flying fishes, etc. The elongate body may be covered with scales or with bony plates; the head is usually covered with rough, bony plates, some of which bear spines. The eyes are set high in the head; the upper jaw is slightly protracted and longer; pyloric appendages develop in moderate number; an air bladder is present. The family is represented on the E. coast of N. America by five species, and elsewhere in almost every sea.

Trigonom'etry (literally, the measurement of triangles), a branch of mathematics by which the magnitude of certain angles and sides of triangles may be determined when others are known; more widely, the mathematical treatment of angles in general and their relations, or of circular functions.

Angles are measured in two ways: (1) By the length of the subtending arc in degrees (a degree being $\frac{1}{360}$ of a full circle); and (2) by the ratio of the length of the subtending arc to that of the radius. In either case the length of the radius evidently has no effect on the result; for instance, a right angle, being subtended by a quarter circumference, is always ninety degrees on the first system, or, on the second, $\frac{\pi}{2}$ (the ratio of $\left(\frac{2\pi r}{4}\right)$ to r). Since π (the ratio of circumference to diameter) is numerically 3.1416 to the fourth decimal place, the fraction $\frac{\pi}{2}$ is 1.5708; but the symbol π is usually retained in calculation, being reduced to figures in the results. The angle whose arc is equal to the radius is thus the "unit angle" in this system, and is expressed in degrees by 57.3° nearly.

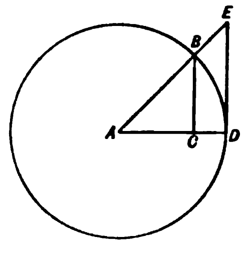


The calculations of trigonometry are based on certain functions, which may be defined as lines or as the ratios of two lines; in the latter form they are called "the trigonometrical ratios." Drawing a so-called "triangle of reference"—a right-angled triangle whose base angle A is the angle whose trigonometrical ratios are to be defined—we then have

The sine of A (written sin A) $= \frac{BC}{BA}$

The cosine of A (" cos A) $= \frac{AC}{AB}$

The tangent of A (" tan A) $= \frac{BC}{AC}$



The cosecant, secant, and cotangent of A are respectively the reciprocals, in order, of these three ratios. The functions may be expressed as lines by assuming a circle whose radius is unity. Here the three ratios above reduce to the three lines BC, AC, and DE.

Various relations may be deduced between these functions; for instance,

$$\sin^2 x + \cos^2 x = 1$$
$$\tan x \cot x = 1$$
$$\tan x = \frac{\sin x}{\cos x}$$
$$\sin(a + b) = \sin a \cos b + \sin b \cos a,$$

etc.

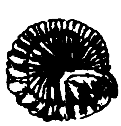
The numerical values of these functions having been calculated and tabulated, triangles may be "solved" by their means. Thus if $\sin A = \frac{BC}{BA}$ as above, $BC = \sin A \times BA$. In other words, having given the length of BA and the value of the angle A, BC may be calculated by looking up the sine in a table and multiplying out.

If the triangle is drawn on the surface of a sphere with arcs of great circles, it is a *spherical* triangle, and its solution is a problem of spherical trigonometry. Here, as the sides are arcs, both they and the angles (called the six "parts") have their trigonometrical functions, and the relations are more complex. For instance, if A, B and C are angles and a, b and c the opposite sides, we have

$$\cos\frac{1}{2}A = \sqrt{\frac{\sin\frac{1}{2}(a+b+c)\sin\left(\frac{a+b+c}{2}-a\right)}{\sin b\sin c}}.$$

The relations of spherical problems to those of navigation on the nearly spherical surface of the ocean are obvious.

Tri'lobites, a group of *Crustacea* which became extinct in Palæozoic times. The body was divisible into three regions—a head with compound eyes, a thorax composed of a varying number of movable segments, and an abdomen in which several segments firmly united to one another may be recognized. The head bore a pair of antennæ and at least four pairs of leglike appendages, the basal joints of which served for the mastication of food. In the thoracic region the feet were two-branched and bore gills. The trilobites are among the most abundant fossils in the older rocks. They appear in the Cambrian and die out in the Carboniferous. The species are very numerous, varying greatly in size.



Trilobite.

Trimurti (trē-môr'tē), Sanskrit, "having three forms," the Hindu trinity, consisting of Brahma, Vishnu, and Siva, considered as an inseparable unity, and as representing the creating, the preserving, and the destroying and regenerating principles of the deity respectively. When represented pictorially the Trimurti has one body with three heads—that of Brahma in the middle, that of Vishnu at the right, and that of Siva on the left.

Trin'idad, island of the W. Indies; near the NE. coast of Venezuela, and N. of the delta of the Orinoco; area, 1,754 sq. m. It is nearly square, with peninsular projections at the angles. Trinidad is generally classed as the southernmost of the Caribbean group; but by its structure, fauna, and flora it belongs to S. America, and in all probability was formerly united to it. A range of low mountains, a continuation of those of Paria, follows the N. coast, some of the peaks attaining 3,000 ft. The remainder of the surface is hilly, or low, with tracts of swamp; hills line the S. coast. There are no true volcanoes, but some small craterlike cavities emit sulphureted hydrogen, and sometimes flames. The celebrated asphalt lake, La Brea, is near the SW. end; it covers 100 acres, the asphalt bubbling up in the center but hardening around the margins, where it is extracted; 115,875 tons were exported in 1906. The soil of Trinidad is fertile, and there are large forests, especially in the N. and E. parts. The climate is warm but healthful, and rains are abundant from May to October; during the winter months the ground is watered by heavy dews. Hurricanes are never felt. A large proportion of the inhabitants are negroes, mixed races, and Hindu coolies. The whites are of English, Scotch, or French descent, with refugees from Venezuela. Most of the population is in the W. part of the island, where are the principal towns. Port of Spain, the capital, is the commercial center. Agriculture is the principal occupation, and the island has many peasant proprietors. The exports are sugar, cacao, asphalt, etc. By its position, Port of Spain controls much of the trade of Venezuela. Trinidad was discovered by Columbus in 1498. The Spaniards, after carrying off the Indian inhabitants as slaves, had only small establishments, later increased by French immigrants from Grenada. The British seized the island in 1797, and have since held it. With Tobago (since 1889) it forms the crown colony of Trinidad. Pop. (1901) 255,148.

Trinita'rians. See REDEMPTIONISTS.

Trin'ity Sun'day, in the Roman Catholic, Anglican, and other churches (but not the Greek Church), the Sunday next after Pentecost. It was established as a church festival, in honor of the Holy Trinity, by Pope John XXII in 1320. It had been long celebrated in some Western dioceses, but not generally before 1400.

Trionychidæ. See TURTLE.

Tripit'aka (Sanskrit, "three baskets"), the sacred scriptures of the Buddhists; so called because made up of three collections called respectively *Sutra,* or aphorisms; *Vinaya,* or discipline; and *Abhidharma* or *Abhidhamma,* metaphysics. (See PALI LITERATURE.) The name Tripitaka is also applied to the Chinese *San-tsang* (three storehouses), which consists of translations, from the first century onward, of original Sanskrit texts, and of commentaries and other matter. A complete copy of this (in 2,200 volumes, requiring 108 ft. of shelf room) is in the library of the India Office, London. An edition in over 500 volumes, printed from movable metal type, was issued in 1881-85 by one of the monasteries in Tokio.

Tri'ple Alli'ance, (1) the league between England, Sweden, and the States-General (1668) for the protection of the Spanish Netherlands against Louis XIV. (2) The league of Great Britain, France, and the Netherlands against Spain and the Pretender in 1717. (3) The league of Austria, Great Britain, and Russia, concluded in 1795. (4) The *Dreibund,* or league of Germany, Austria, and Italy, formed for mutual protection in case of attack by other powers. A dual alliance between Austria and Germany had been formed in 1879, and Italy was admitted as a third member in 1882.

Trip'oli, one of the thirty-eight vilayets or provinces of Turkey, and, including Barca on the E., the only region in Africa now directly controlled by Turkey. It has over 700 m. of sea frontage on the Mediterranean, adjoins Egypt and the Libyan waste on the E., includes Fezzan on the S., and has Tunis on its

W. frontier. Though about one third larger than Texas, its population is only 800,000 to 1,000,000. Its coast towns are the natural points of departure for caravans to the W. Sudan. Most of the region is poor and sandy, and the sands from the deserts, together with vast quantities blown inland from the sea border, have restricted the areas where agriculture can flourish. Nine tenths of the country has no population. The rainfall is small, and Tripoli has not a single perennial stream; but it has many small areas that are very fruitful, particularly along the low mountains that bisect it from E. to W. and from N. to S., and along the usually dry water courses. The almond tree, olive, and date flourish, and the vine is widely cultivated, though not for wine making.

The fauna, like the flora, is poorer than in countries of the coast farther W. Neither lions nor panthers are found in the mountains, crocodiles cannot live, and the elephants that once roamed over the country were long ago driven out by destruction of the forests. Foxes, hares, wolves, monkeys, gazelles, and antelopes are the only game. There are a few reptiles, but not many birds, most of them being birds of passage. Camels and asses are the chief domestic animals. Fat-tailed sheep are raised to some extent, but goats are much more numerous. The population consists mainly of Arabs and Berbers. The Berbers, representing the ancient inhabitants, are probably more numerous, but there has been great admixture of these families. Thousands of slaves from the Sudan form an important element in the population. The Turks, though in absolute control of the country since 1835, form only a small minority. They hold themselves above the people they govern and are looked upon as strangers. Arabic, and not Turkish, is the official language. The Jews are a very old element in the population, and suffer much ill treatment. The only port of importance is the capital, Tripoli, and the chief exports are esparto grass, ostrich feathers, and a little wheat. The total export and import trade with Europe amounts only to about $6,000,000 a year.

Tripoli, a port built on the site of three ancient towns on the African coast of the Mediterranean, capital of the Turkish province of Tripoli. The city has trade with Europe and a large caravan trade with the W. Sudan, but it is far inferior, commercially, to several other cities on the S. shores of the Mediterranean. It presents a charming aspect from the sea, but a nearer view shows dilapidated buildings, narrow and tortuous streets, and abounding dirt and refuse. Negro slaves have introduced cabins like those in which they lived in the Sudan. Much has been done to improve appearances and sanitary conditions. Of late years its largest source of prosperity has been the export of esparto grass. Pop. est. from 25,000 to 30,000.

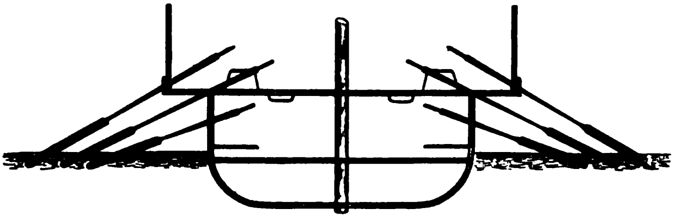
Tripoli, seaport town of Syria; in the vilayet of Beirut, about 40 m. NNE. from Beirut. Renowned for its commerce in antiquity, it was specially important during the crusades. El-Kadisha, "the sacred river," which rises among the grove of cedars on Lebanon, renders the vicinity fertile and unhealthful. It has a fine and safe harbor. It exports raw silk, sponges, soap, olive oil, cotton, and fruits. Pop. 30,000, mainly Mussulmans.

Tri'pos, the system of honors examination at the Univ. of Cambridge, England. The derivation of the name goes back to an early period, when the student who was being examined sat on a three-legged stool. The tripos is usually taken at the end of the third year of residence. There are the mathematical tripos, classical tripos, moral sciences tripos, etc. The one who obtains the highest place in the mathematical tripos is called the senior wrangler. See WRANGLER.

Trip'tych, a set of three tablets or panels hinged together. The use of the appliance is generally to hold either writing or painting in such a way that it is protected from injury. See DIPTYCH.

TRIPTYCH.

Tri'reme, a galley or vessel with three benches or ranks of oars on a side, a common class of warship among the ancient Greeks, Romans, Carthaginians, etc. The trireme was also provided with a large, square sail, which could be raised during a fair wind to relieve the rowers, but was never employed in action.



TRIREME.

Trisec'tion of An'gle, a celebrated problem among the ancient geometers. It belongs to the same class of problems as the duplication of the cube and the insertion of two geometrical means between two given lines. Like them, it cannot be solved by the methods of elementary geometry. It may, however, be solved by means of an axillary curve called a conchoid; it can also be solved in several ways by the principles of higher geometry.

Trismegis'tus. See HERMES TRISMEGISTUS.

Tristan' da Cunha (dä kôn'yä), the largest of a group of islands in the S. Atlantic. Area, 40 sq. m. It is mountainous, its center rising into a volcanic peak 7,640 ft., but fertile, well provided with water, and healthful. It was discovered in 1506 by the Portuguese Tristan da Cunha, and occupied by British troops during the captivity of Napoleon on St. Helena. Pop. (1903) 75. Property is held in common; there is no crime and no strong drink. The other islands are Inaccessible Island and the three Nightingale islands—Nightingale, Stoltenhoff, and Middle Isle. These are frequented by seals and sea fowl.

Tri'ton, in Greek mythology, a marine deity, sometimes the son of Poseidon and Amphritrite, sometimes a subordinate sea god, and sometimes even localized as the god of the Libyan Sea. In art he is represented as a young man with the body ending in a fish tail, and with a trumpet of conch shells, with which, at the command of Poseidon, he bade the waves be still. Also, a name given (1) to a mollusk; (2) to the aquatic salamanders, especially of Europe.

Tri'umph, the highest military honor in ancient Rome; a state pageant in which a victorious general or naval commander, preceded by the Senate and by the spoils and prisoners, was drawn by four horses along the Sacred Way and followed by his army to the temple of Capitoline Jove, where solemn sacrifice was offered. In order to triumph, the general must be in possession of the highest magisterial power as dictator, consul, proconsul, prætor, or proprætor. The war, too, must be one against foreign foes, and must have been brought to a conclusion. There were also other conditions which were not uniformly observed. The triumphal procession was very brilliant, and sometimes lasted two or three days. It was customary to put to death some of the hostile chiefs during the triumphal march. There are in all about 350 recorded triumphs; the last seems to have been celebrated by Diocletian in 302 A.D.

Trium'vira, or **Tres'viri,** in ancient Rome, a board of three men. Besides certain permanent boards, the name was applied to various extraordinary commissions appointed to perform some special public duty. The coalition of Cæsar, Pompey, and Crassus in B.C. 60 is often, though improperly, called the first triumvirate. The men who constituted it bore no official title, and exercised only an usurped power. The second triumvirate (Octavian, Mark Antony, and Lepidus) was officially recognized by the Senate, and the three magistrates bore the name of *Tresviri reipublicæ constituendæ* (triumvirs for arranging public affairs).

Triv'ium, name applied in the Middle Ages to the arts, grammar, rhetoric, and dialectic, which were taught in the cloister and cathedral schools. The trivium and quadrivium—music, arithmetic, geometry, and astronomy—made up the seven liberal arts.

Trochu (trō-shü'), **Louis Jules,** 1815-96; French general; b. at Le Palais; made his military career chiefly as aide-de-camp and in the ministry of war; distinguished himself at the storming of the Malakoff as commander of the First Brigade of the First French Corps. By his pamphlet "L'Armee Française en 1867," revealing the weakness of the French army and advocating the adoption of Prussian methods, he lost the favor of the emperor Napoleon. He, however, was appointed Governor of Paris, 1870; after the breaking out of the revolt in Paris he was made commander in chief of the forces defending the city and President of the Government of National Defense, which position he held until the surrender of the city to the Germans. He was chosen to the National Assembly in 1871, but retired to private life in 1873.

Trog'lodytes, with the ancient writers the name of races found in the Caucasus and elsewhere, but especially along the coasts of the Red Sea, which region was called Regio Troglodytica. Common to these tribes was their low grade of civilization. They lived in caves and depended on herds of cattle for their livelihood. The name is now applied to cave dwellers generally. *Troglodytes* is the name both of a genus of wrens and of the genus containing the chimpanzee and gorilla. See CAVE DWELLERS.

Tro'gons, family of beautiful tropical birds of S. America, Asia, and Africa which nest in holes in trees. The most gorgeous of the fifty known species is the resplendent trogon or quetzal of Guatemala, which is of a brilliant metallic green above and red below.

Trollope (trŏl'ŭp), **Anthony,** 1815-82; English novelist; b. London; educated at Winchester and Harrow; 1834 to 1867 was connected with the British postal service, for which he made many voyages, and later traveled extensively in the U. S., the W. Indies, and Australia. In 1869 he was an unsuccessful candidate for Parliament, in the Liberal interest. He wrote several books of travel and many novels. Among his books, which number about seventy, are "The Warden," "Barchester Towers," his first decided success (1857); "Doctor Thorne," one of his best works; "The Last Chronicles of Barset," "The Way We Live Now," "The Prime Minister," "The American Senator," "The Duke's Children," and a "Life of Cicero" (1881). An "Autobiography" describes his methods of work, which were very systematic, and testified that for the last twenty years his books had yielded him nearly £70,000. Trollope's fiction is of the realistic type, honest in purpose, truthful, and solid, but often dull and creeping in style. He excelled in the portrayal of clerical characters and the humdrum life of rural parishes.

Trolls, a name often applied to the giants of Scandinavian mythology and to a similar class of beings in modern Scandinavian folklore. The trolls of folklore are very powerful and hostile to man. They are regarded as extremely stupid, and hence men usually defeated them in their attempts to capture fair maidens. Princesses taken into the subterranean mansions built of gold and silver easily deceive the credulous trolls, and so make their escape.

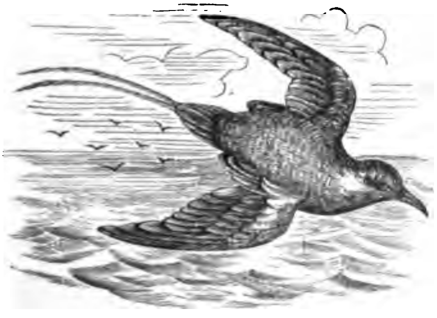
Trom'bone, a large brass wind instrument of the trumpet species, supposed to be the same as the sackbut of early writers. Its peculiarity consists in the facility of deepening the tones by means of sliding tubes, making it one of the most effective instruments in an orchestra. There are three kinds—alto, tenor, and bass.

Tromp, Maarten Harpertzoon van, 1597–1653; Dutch admiral; b. Briel; in 1624 was in command of a frigate. In 1637 he was made lieutenant-admiral, and in 1639 gained a European fame by his two great victories over the Spanish fleet off Gravelines and in the Downs. He was at first less successful in the war between England and Holland, and, having been defeated by Blake, he even lost his command in 1652. He was soon reinstated, and defeated Blake completely in the Downs, December 10, 1652. In February, 1653, he fought against the combined fleet of Blake, Monk, and Deane, and, though worsted, showed courage and skill and effected a successful retreat. He fought another indecisive battle in June. In July, 1653, he again attacked the English fleet. The battle lasted two days, but was finally lost by the Dutch, and Tromp himself was killed, August 8, 1653. His son, CORNELIUS TROMP, 1629–91, b. Rotterdam, achieved almost an equal fame, held the highest positions in the Dutch navy, and served with distinction in Denmark.

Trom'sö, port of N. Norway and one of the most N. towns in the world; lat. 69° 38′ N.; in the Tromsö Fiord. The port is commodious, and is most frequented by Russians, who come for salt and smoked fish. The fishing industry is active. The town was founded in 1794, but did not become important until the middle of the nineteenth century. Pop. (1900) 6,955.

Trondhjem (trŏnd'yĕm), formally DRONTHEIM, the ancient *Nidaros*, the oldest town of Norway (founded 996); beautifully situated on the S. shore of Trondhjemsfjord; 250 m. N. of Christiania. Its cathedral, in which the kings are crowned, has been restored. Its breweries and distilleries are extensive and celebrated. Much copper, salt and dried fish, oil, and timber are exported. Pop. (1900) 38,156.

Tro'phy, among the Greeks a memorial erected on the battlefield by the victors on the spot where the enemy turned to flight or retreat. Originally, trophies were of wood or of simple armor affixed to a tree. It was equally unlawful to destroy or repair a trophy, since it was considered unwise to perpetuate hostile feelings. In later times the Romans adopted the custom of erecting trophies.



TROPIC BIRD.

Trop'ic Bird (so called because they are not commonly seen outside the tropics), a sea bird somewhat larger bodied than a pigeon, having the plumage white with fine black markings above, pure white or rosy below; the bill is red or yellow, feet dark. The two central tail feathers are much longer than the others, and from their faint suggestion of a marlinspike these birds have been dubbed boatswain birds. They occur occasionally on the S. coasts of the U. S.

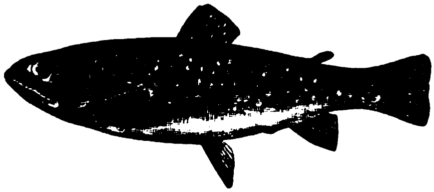
Trop'ics, two circles on the celestial sphere parallel to the equator and situated on each side of it at a distance equal to the obliquity of the ecliptic—about 23° 28′; reached by the sun at the point of its greatest declination N. or S., the solstice, from which it turns again toward the equator. The N. circle is called the Tropic of Cancer and the S. the Tropic of Capricorn, from the names of the two signs of the Zodiac at the first point of which they touch the ecliptic. The name is given also to the two corresponding parallels of terrestrial latitude, and to the region lying between those circles, the Torrid Zone, or near them on either side. See SOLSTICE.

Tros'sachs, a wooded glen in Perthshire, Scotland, E. of Loch Katrine, made famous by Sir Walter Scott in the "Lady of the Lake."

Trot. See GAITS.

Trou'badours. See TROUVÈRES.

Trout, a name given to several fishes, but originally applied to the trout of England and N. Europe (*Salmo fario*), and properly used for members of the *Salmonidæ* only. Trout are mainly restricted to fresh waters, where they reside the year round, not, like salmon, merely visiting fresh water to spawn; but some, like the sea trout of Labrador, may have the same habits as the salmon, while others which thrive in landlocked waters visit the sea when opportunity offers. Trout are all naturally inhabitants of the N. hemisphere only, but some species have been introduced into New Zealand and Australia. They are active and powerful, and on this account, as well as for their beauty and fine flavor, are favorites with anglers. They reside in clear cold streams and lakes, and are among the most N. species of fresh-water fishes. They feed on small fishes, insects, and larvæ, those of the mosquito forming a considerable portion of their food in the lakes of Greenland.



SPECKLED TROUT.

There are about a score of species in N. America to which the term trout is applied, but only eight belong to the genus *Salvelinus* or brook trout. The salmon trout of Europe is *Salmo trutta*, residing in salt water and ascending rivers. The salmon trout or lake trout of N. America is *Salvelinus namaycush*, a large species restricted to fresh water. The rainbow trout and Dolly Varden trout occur on the Pacific slope. In the S. parts of the U. S. the name is applied to the weakfish and to the black bass.

Trouvères (trō-vār'), or **Trou'badours,** the courtly lyric poets of mediæval France, as distinguished from the popular poets, the jongleurs, to whom was due the chansons de geste and the earliest French lyric poetry. The beginning of courtly poetry in France proper is to be put about the middle of the twelfth century, and the inspiration to it was almost excusively Provençal.

Tro'ver, the common-law form of action by which damages are recovered for the conversion of chattels. It was originally designed for the particular case of the defendant's finding a thing belonging to another, and appropriating it to his own use; whence the plaintiff's pleading necessarily contained an averment of the loss and finding—in law French, *trouver.*

Troy, Tro'ja, or **Il'ium,** the scene of the Homeric "Iliad" and the metropolis of the Troad, the coast region extending from Cape Lectum on the Ægean to Dardanus and Abydus on the Hellespont. The Troad comprised a broad, undulating plain sloping from the foot of Mt. Ida to the sea, and traversed by the rivers Scamander and Simoïs. This plain was densely peopled by a mixed race of Pelasgians and Phrygians, and contained many cities, of which Troy was by far the most splendid and powerful. Troy was founded by Ilus, the son of Tros, and developed rapidly; legend tells how, under Laomedon, the son of Ilus, Poseidon himself built its walls. It had a fortified acropolis, called Pergamum, which contained the temples and royal palaces. Under Priam it reached its highest splendor and experienced its downfall. Priam's son, Paris, carried off Helen, the wife of Menelaus, and in order to punish this outrage a Greek army landed in Troas, besieged Troy for ten years, and finally destroyed it, though the Kingdom of Troy seems to have continued centuries after the destruction of its capital. The site of the city is disputed.

According to Homer it was not in the plain, but stood on a hill between the Scamander and the Simoïs, which united in front of it. In ancient times it was generally believed that New Ilium, a city of little importance on the Scamander, and of which some ruins are still extant near the present village of Hissarlik, occupied the same site as Old Ilium. Although other sites have been suggested by later scholars, the modern view is that of antiquity since the extensive excavations of Schliemann at Hissarlik (1871–82).

Troy, capital of Rensselaer Co., N. Y.; at the head of steamboat navigation on the Hudson River, 150 m. N. of New York. The city is noted for its extensive industries, which include the manufacture of iron, steel, stoves, ship chains, cotton cloth, knit goods, machinery, horseshoes, bells, fire brick, paint, paper, brushes, oilcloth. Troy has more than 25,000 persons employed in the shirt, collar, cuff, and laundry industries, and makes $1,000,000 worth of valves yearly.

The most widely known educational institution is the Rensselaer Polytechnic Institute, and the second institution of note is the Emma Willard School, founded in 1821, and enlarged in 1895 by Russell Sage. Among the most prominent edifices are the U. S. Government building and the state armory, while the Earl Crematory, in Oakwood Cemetery, is the finest in the world.

Troy was laid out in 1787 and incorporated as a city, 1816. It has been almost destroyed by fire three times. Pop. (1910) est. at 76,000.

Troyon (trwä'yōṅ), **Constant,** 1810–65; French painter; b. Sèvres; began to exhibit landscapes about 1836. He introduced cattle in his landscapes after about 1848, and painted them, as well as sheep, with great knowledge and admirable simplicity. His pictures rank among the finest of the modern French school. He was a colorist of great strength, and his pictures are composed with nobility and grandeur of line.

Troy Weight (from *Troy Novant,* a monkish name for London), a system of weight, employed in England and the U. S. for gold, silver, jewels, and drugs. The troy pound has 12 oz. One pound troy is to 1 lb. avoirdupois as 144 is to 175. The troy ounce is to the ounce avoirdupois as 192 is to 175.

Truce, or **Ar'mistice,** a temporary stoppage of hostilities contemplating a longer duration and a wider application than the brief cessation of hostilities which is called a suspension of arms. A truce implies a return to a state of war, while a peace presupposes that the causes of war have been removed. The cessation of hostile operations may apply to an individual only, through a flag of truce, a passport, or a safe conduct; or it may apply to the whole or a portion of the armies of the belligerent. A flag of truce, a white flag to which attention is called by the sound of a trumpet, is used to open negotiation for any cause during hostilities. There is no obligation to receive it, and in the midst of a battle it may be that injury is done to its bearers inadvertently; nevertheless by law and usage they are inviolable. The flag of truce must not be employed to spy out an enemy's position or to delay a battle until reserves can be brought up; a belligerent can take measures to prevent such abuses.

The theory of a truce is that neither party shall be helped in his military operations by it; that such affairs shall be in the same position at its end as at its beginning. But this principle is not carried out so fully as to forbid those operations which could have been carried on without military interference had no truce existed. Thus in a besieged town or fortress nothing can be done during a truce by either party which the other was in a position to prevent, but fortifications not under fire could be built or strengthened and supplies could be brought in by ways beyond the other's control. Violation of a truce by one party causes its immediate termination. So, too, if made for a definite time, and that time has expired, hostilities are resumed without further notice.

Truce of God, in the Middle Ages, an institution which sprang up in France and Germany by which nobles and princes bound themselves to keep the peace, to abstain from unlawful wars, and to protect clerics, women, merchants, pilgrims, peasants, and other noncombatants. In the Council of Charroux, in 989, the Church decreed a special peace to the unarmed clerk and laborer. This attempt to check violence was in part successful, but the task of maintaining a general peace was hopeless, and the Church contented itself with limiting the feudal warfare. Accordingly, at the Synod of Tuluges, in 1027, it was decreed that warfare should be suspended from Saturday till Monday. This was afterwards extended to the interval from Wednesday evening to Monday morning in every week and to nearly all the more important fasts, feasts, and holy seasons of the Church. England and Italy adopted the custom, which was confirmed by several Church councils, among which were the Second and Third Lateran councils (1139 and 1179). The triumph of legal over feudal government did away with this institution and with the necessity for it.

True Cross. See HOLY ROOD.

Truf'fle, any fungus of the genus *Tuber* and other closely allied genera. Truffles are nearly all subterranean in growth, and are from an inch to 6 in. in diameter. In France dogs and pigs are trained to recognize their odor and dig them up. The truffle is one of the choicest of the edible fungi, and its culture has been attempted with some success. Some species are found to a limited extent in the U. S., but most truffles come from France, Italy, and England.

FRENCH TRUFFLE.

Trum'bull, John, 1756–1843; American painter; b. at Lebanon, Conn.; graduated at Harvard, 1773; joined the army in 1775 as adjutant, but left the service in 1777; in 1780, went to Paris, thence to London, and studied with West; returned to the U. S. in 1782, and remained till peace was concluded, then went back to England to resume his studies. His first historical work, "The Battle of Bunker Hill," familiar through engravings, was exhibited in 1786, and was followed by "The Death of Montgomery before Quebec" and the "Sortie from Gibraltar." In 1789 he returned to the U. S. with the purpose of commemorating on canvas the chief persons and events of the Revolution; among the likenesses taken were several of Washington. He returned to England as secretary to John Jay, and from 1794 to 1804 was in the diplomatic service. He devoted seven years (1822–29) to painting four grand pictures for the rotunda of the Capitol at Washington—the "Declaration of Independence," the "Surrender of Burgoyne," the "Surrender of Cornwallis," and the "Resignation of Washington at Annapolis." Abt. 1827 he disposed of his whole collection, fifty-seven pictures in all, to Yale College, in consideration of an annuity of $1,000.

Trumbull, Jonathan, 1710–85; American statesman; b. Lebanon, Conn.; graduated at Harvard, 1727; studied theology, but ultimately devoted himself to the law; was judge, lieutenant-governor, and then governor, 1769–83; was an energetic supporter of the popular cause; was considered a leader of the Whigs of New England, and his advice was much valued by Washington. The popular epithet, "Brother Jonathan," as a personification of the U. S., is said to have originated from Washington's habit of addressing him by that familiar title when requesting his opinion.

Trump'et, in acoustics, any instrument used for the conveyance to the ear of articulate sound from a distance. In music a wind instrument, usually consisting of a brass tube some 8 ft. in length, expanding at the end into a bell-like shape. By means of slide and keys the capacity of the trumpet has been largely increased.

Trump'eter, a breed of domestic pigeons, so called from the deep sound of their coo. The characteristic feature of the bird is the thick spreading crest which overhangs the eyes to such an extent that these birds cannot care for their young until it is trimmed. The preferred colors are white and black.

Trump'et Fish. See BELLOWS FISH.

Trumpet Flow'er, a popular name for various species of *Bignonia* and *Tecoma,* mostly shrubs and woody vines, though in tropical regions some of the species are large trees. The native species of the U. S. are *B. capreolata, T. radicans,* and *T. stans.* The first and second are fine climbers. *T. capensis* from S. Africa, *T. grandiflora* from Japan, and other fine species are often cultivated.

Truss, in surgery, a device worn to support a hernia. It consists of a pad so arranged with a spring and straps that it may be retained in position without interfering with the patient's movements. In engineering a truss is a framed structure so arranged that the principal members take only stresses of tension or compression. A simple truss is one supported at its two ends, and it exerts only vertical pressures on the supporting walls or piers, while an arched truss exerts horizontal pressures also.

Trust Com'panies, a modern form of banking organization generally authorized to receive and hold moneys and property in trust and on deposit from courts of law or equity, executors, administrators, assignees, guardians, trustees, corporations, and individuals, and are also usually authorized to be appointed by probate courts as trustee under wills upon terms and conditions agreed upon or prescribed by statute. They are also usually made legal depositories of money paid into court by parties to legal proceedings or of money brought into court by reason of an order or judgment.

Trustee′, in law, a person to whom property is legally committed in trust for the benefit of some other party or parties, or for some special purpose. The person for whom or in whose favor the trustee holds the estate, or any interest therein, is called the *cestuique* trust. No one is compelled to undertake a trust, but if once accepted it cannot be renounced unless the trust deed contains a provision allowing it, or a competent court grants a discharge, or by the consent of all those beneficially interested in the estate. Trustees are liable for the consequences of any breach of trust, however innocent, and the estate of a trustee deceased, who has misapplied the trust fund, is liable for the deficiency; but, generally speaking, the law only requires of a trustee the same amount of care and prudence he would be expected to display in managing his own affairs. Where there are several trustees, each is liable for his own acts and receipts only, unless where there has been common agreement and authorization. As their office is considered purely honorary, trustees are not entitled to any allowance for their trouble in connection with the trust. They may not invest the trust funds on personal security, or in stock of a private company, unless specially authorized to do so by the trust deed; but they are permitted to invest in government stocks, debenture, preference, or guaranteed stock of railways, stock of municipal corporations, and generally on satisfactory real security.

Trusts, in law, a kind of ownership, whereby property is vested in certain persons for the use or benefit of others. The persons who hold the legal estate are the "trustees"; those for whose benefit the property is held or administered are known as the *cestuis que trustent*, or beneficiaries. Trusts, in their present form and variety, date back only to the Statute of Uses, passed in 1535. Prior to that statute the practice of conveying lands to one person to the "use" of another had become so common as to affect a large proportion of the land in the kingdom. *Express trusts* arise from the direct and intentional act of the parties, evidenced by some declaration which is generally contained in a written instrument. The most common examples of this class are those created by marriage. *Resulting* (*or implied*) *trusts* arise, in the absence of any express declaration, by implication from the acts of the parties. Where the circumstances attending an assignment or conveyance of property are such as to raise a presumption that a trust, although unexpressed, was intended, such a trust is said to "result" from the transaction. A *constructive trust* is raised by a court of equity "wherever a person, clothed with a fiduciary character, gains some personal advantage by availing himself of his situation as trustee." The trust is in such cases said to arise by *construction*, without reference to any intention of the parties, either expressed or presumed. Property may be given in trust for specified objects where the beneficiaries are completely indeterminate—as, for example, a gift to aid in spreading the gospel or to relieve the poor—or where the beneficiaries constitute a known class, but the individuals are uncertain, as a gift to provide for the poor of a particular town or to support the scholars in a designated school. These are termed "charitable trusts." In England charitable trusts are treated with liberality by the courts, and if the design of the donor cannot be carried out exactly, the courts will permit the application of the charity to objects as near to the original design as possible. In some of the U. S., charitable trusts are regarded as attempts to create perpetuities, and therefore opposed to the policy of the law, and a corporation is created to administer the trust.

Commercial Trusts.—The great trade combinations which, under the denomination of trusts, have become such a marked feature of modern industry, especially in the U. S., owe their form and designation, though not their importance, either in law or in the industrial organization of society, to the trust proper, as developed in Anglo-Saxon jurisprudence. The term is therefore not wholly a misnomer, though it becomes so when it is popularly applied to such combinations irrespective of their form and mode of creation, or when the term is employed in a peculiar and exclusive sense to describe the gigantic modern trusts created for industrial purposes.

The first form of combination in the U. S. was essentially a "trust," the concerns participating in it giving authority to a board of trustees to control the affairs of the association. This was called "pooling," and, being looked upon with disfavor by the courts as an unlawful restraint of trade, the "pools" were dissolved, although their purpose was in many cases continued by informal contracts, or "gentlemen's agreements," to maintain prices and divide territory to save wasteful competition. But this evasion of the law proved unsatisfactory because it could not be strictly enforced, and soon gave way to the modern "holding corporation" or trust. Thanks to the liberality of the incorporating laws of such states as New Jersey, it is possible to form a corporation not only to do any lawful business, but also to hold the stock of other corporations. The present business combinations or trusts are therefore formed by first obtaining such a charter with power to do business and hold the stock of other corporations doing similar business. Then a proportion of the stock of each of the concerns composing the trust is transferred to the holding corporation, so that its directors have absolute control and practical ownership of all the participating firms. The Standard Oil Company was among the first to organize on this basis, while the United States Steel Corporation, with over $1,432,000,000 of outstanding securities, is the largest trust in the world. There are now in the U. S. about 440 large industrial, franchise, and transportation trusts with a total floating capital of $20,379,162,511.

In addition to these trusts, covering nearly one quarter of the business of the country, there are innumerable minor combinations to keep up prices, divide territory, or restrict the output of factories.

The various methods of dealing with the economic questions raised by these vast aggregations of capital are discussed under their respective heads. See CORPORATION.

Try′on, William, abt. 1725–88; American colonial governor; b. Ireland; became distinguished in the British army; was appointed lieutenant-governor of N. Carolina, 1764; governor, 1765; suppressed the revolt of the Regulators, treating the prisoners with cruelty; erected at the cost of the province a magnificent residence at Newbern; governor of New York, 1771; detested by the patriots for his acts of rigor and severity, and especially for the destruction of Danbury, Fairfield, and Norwalk, Conn., by expeditions conducted by him in person; resigned, 1778, and returned to England; became a lieutenant-general, 1782.

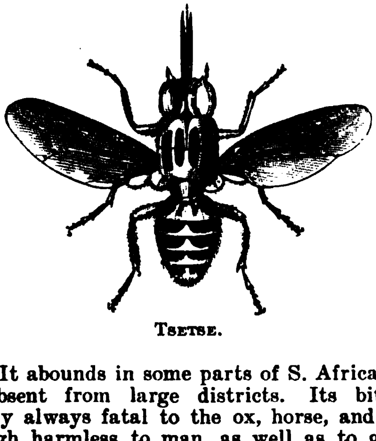
Tsad. See TCHAD.

Tsar. See CZAR.

Tsarskoye-Selo (tsär-skō′ī-sä̆′lō), or **Zarskoye-Selo,** town of Russia, 14 m. S. of St. Petersburg. It contains two magnificent palaces which are used by the imperial family as summer residences. The park and pleasure grounds cover an area 18 m. in circumference. The Cathedral of St. Sophia is a copy in miniature of the mosque in Constantinople. Pop. (1897) 22,353.

Tschaikovsky (chī-kŏf′skī), **Pieter Ilitch,** 1840–93; Russian composer; b. Wotkinsk, Russia; entered the St. Petersburg Conservatory, 1862. His first composition was a cantata to Schiller's "Ode to Joy." Professor, Moscow Conservatory, 1866–77; after that he devoted himself entirely to composition. His works include several operas, symphonies, overtures, and other orchestral pieces, solos for piano and other instruments, chamber music, and many vocal pieces, sacred and secular. At the opening of the Carnegie Music Hall he visited New York, and conducted several of his own compositions.

Tsetse (tsĕt′sē), a dipterous insect, *Glossinia morsitans,* a little larger than the common fly. It abounds in some parts of S. Africa, but is absent from large districts. Its bite is nearly always fatal to the ox, horse, and dog, though harmless to man, as well as to goats, asses, mules, and the wild beasts of the regions it inhabits. The germ which causes sleeping sickness is supposed to be transmitted by this insect.



TSETSE.

Tsushi′ma, strait, 100 m. wide, between Japan and Korea.

Tsze Hsi An, 1834–1909; dowager empress of China; b. Canton; married Emperor Hsien-Feng, who was succeeded by her son, Tung-Chih, and after his death (1875) she became practically empress, as the regent over her nephew, Kwang-Hsu. She encouraged the Boxers (q.v.), and (1900) ordered the expulsion of foreigners, then went into exile till 1902.

Tuamotu (twä-mō′tō), group of small islands in the Pacific Ocean, E. of Tahiti (to which they are nominally subject) and S. of the Marquesas; pop. abt. 7,000. They number between eighty and ninety, and are mostly of coral formation. The best known are Chain and Pitcairn Islands, and the Gambier Islands, near the S. border of the archipelago, the largest of which is Mangareva. The group was discovered, 1797.

Tu′ber, in plants, a thickened subterraneous portion of the stem, often bearing latent buds or eyes, and usually composed of cellular substance richly stored with starch or some other equivalent principle. Many of the tubers, like that of the common potato, are of great value as sources of human food.

Tuber′cular Meningi′tis. See MENINGITIS.

Tuber′culin, a dark-brown fluid obtained from the pure culture of the specific germ of tuberculosis, first prepared by Prof. Robert Koch, of Berlin, in 1891, for the cure of the early stages of tuberculosis; hence known also as *Koch's lymph* and *Koch's specific.* The remedy acts curatively upon lower animals, especially guinea pigs and rabbits, and many undoubted cures have followed its use in the human subject also; but it was quickly brought into discredit by the exaggerated accounts of its virtue which appeared in the public press, and by its injudicious use upon far-advanced cases. Tuberculin has a decided diagnostic value by its producing fever in tuberculous animals and in man, whereas no such effect follows its application when the subject of such a trial is free from tuberculosis. This test is now largely applied to milch cows, and its benefit in thus preventing the use of the milk and flesh of tuberculous animals as food is of the greatest value.

Tuberculo′sis, an infectious and somewhat contagious disease of man and many animals, which is caused by the growth and specific action of a microörganism, the bacillus of tuberculosis. Its ravages are so great that not less than one seventh of all deaths are due to this cause; and, if the number of cases in which it has become latent or cured are added, it is not unlikely that the saying of a German physician is true, that "sooner or later everybody has a little tuberculosis." The favorite seat of tuberculosis is in the lungs, but any tissue or organ of the body may be affected. From the earliest times it has been known that the lungs of persons dead of pulmonary tuberculosis, or phthisis, contain yellow masses; these were called tubercles (small nodules), and from them the name tuberculosis is derived. At the earliest stage gray or miliary tubercles will be found, and these subsequently degenerate and become yellow. Gray tubercles may occur also in the membranes of the brain and in any of the solid organs. The tendency in all parts of the body is for the tubercular masses to undergo cheesy change, and later to liquefy and form excavations. This is eminently true of the pulmonary forms.

Susceptibility to tuberculosis, or consumption, depends upon many causes. In the first place, animal families differ in this regard. The disease is rare among the cold-blooded animals, but common among many of the domesticated animals, particularly the ruminants. Of the greatest significance to man is the frequency of the disease in cattle. Dogs, cats, and horses are less prone. The goat seems quite immune. Races of men differ largely in susceptibility. In the U. S. the negro seems specially susceptible. The tendency to tuberculosis, the susceptibility, is regularly inherited, and especially from the maternal side. An individual with hereditary liability may increase this, or one without susceptibility may acquire it, by the manner of life. Any exposing occupation or ill-conditioned residence, or causes that deprave the system or occasion pulmonary troubles, bronchitis, and the like, make the individual prone to become infected. Certain occupations, such as mining, stone-cutting, grinding, hair-cutting, or sewing, which expose the individual to the breathing of dust, aid in the development of phthisis. But individuals predisposed may escape the disease by careful attention to health and the avoidance of the causes which increase susceptibility.

The discovery of the bacillus of tuberculosis was made by Koch, and published in 1882. The bacillus has been proved to be the specific cause of all forms of tuberculosis. Without this bacillus, tuberculosis cannot arise. As a rule, the bacillus enters the system by the inspired air, and in this way the disease is mainly contagious. The breath of phthisical patients does not contain the bacilli, but the sputa become dried on floors or the ground, and are then carried by the air to the lungs. Intestinal tuberculosis is generally due to the swallowing of infected material. The infection may be conveyed by milk of tuberculous cows, by infected meat, or other food. Some cases of tuberculosis result from direct inoculation, as in cases of tattooing, vaccination, or injuries to the hands of surgeons or dissectors. Among the more common situations of tuberculosis are the lungs, intestines, serous membranes, bones, and lymphatic glands. Since the discovery of the tubercle bacillus a number of diseases have come to be recognized as tuberculous. Among these are scrofula (in many of its forms), certain bone diseases, lupus vulgaris, and other skin affections due to direct inoculation. In most cases scrofula affects the lymphatic glands, which enlarge, then soften, discharging thick, purulent material. The glands affected are frequently those of the neck and those within the chest at the root of the lungs.

The symptoms depend upon the organ or part involved. The individual loses strength and flesh, he grows pale and worn in appearance, fever supervenes and becomes peculiarly irregular, coming on in the afternoon and subsiding in the morning; the patient perspires freely, and sometimes drenching night sweats add to his weakness. Chills may be noted; and after a tedious illness, as a rule, the victim perishes of exhaustion and general intoxication. Individuals susceptible to the disease, especially to pulmonary tuberculosis, often present a characteristic appearance, in which the flattened chest, large bones, emaciated frame, straight black hair and dark eyes, and sallow complexion take a prominent part. External tuberculosis, such as that of the skin (lupus), bones, and lymphatic glands, is, as a rule, less malignant than that of internal organs, and may be attended by few general symptoms. Many persons become tuberculous and recover without having exhibited any decided symptoms, and in many more the disease is arrested before its ravages become extensive; 5 to 40 per cent of all bodies examined show some evidence of past tuberculous disease which had become arrested. Von Pirquet has recently shown that the routine abrasion made preliminary to vaccination against smallpox, if moistened with tuberculin (Koch), will, in a tuberculous individual, produce a characteristic local reaction. External tuberculosis is more hopeful than other forms. Fresh air, change of climate, tonics, nutrients such as cod-liver oil, and the careful regulation of every detail of the life of the patient constitute the reliable treatment. Special methods are useful according to the locality affected; and, in particular, surgical procedures are valuable in external tuberculosis. Specific remedies have been lauded by hundreds, but as yet none has been found. See CONSUMPTION.

Tube'rose (the *Polyanthes tuberosa*), a plant with a stem 2 to 3 ft. high, a native of Mexico, much cultivated in greenhouses and in the open for its beautiful and highly fragrant white flowers, which are employed by perfumers. Some 24,000 lb. of tuberose flowers are yearly produced in the valley of the Var, in France, for perfumers' use. The common name is derived from the tuberous character of the plant, and is therefore *tuberose*, not *tube-rose*. The flowers consist of a funnel-shaped slightly curved tube, with six lobes, often tinged with rose without and creamy white within.

DOUBLE TUBEROSE.

Tü'bingen School, the common title of three groups of theological writers connected with the Univ. of Tübingen, in Germany. (1) The old Tübingen school based belief in the Bible upon the authority of Jesus. Starting with the doctrine that the Bible was a revelation, it defended its position by an appeal to Scripture interpreted by a grammatical and historical exegesis in opposition to the current rationalism. (2) The modern or younger Tübingen school, founded by F. C. Baur (professor, 1826–60), whose principal pupil was D. F. Strauss. It began with studies in the history of Christian doctrines, transforming the divine revelation into a simple historical evolution and subjected the New Testament to a searching critical examination, attacking its authenticity and integrity. Finally, it undertook a reconstruction of the origin and development of Christianity, without admitting such ideas as revelation, inspiration, miracles, etc., as operating forces. (3) The Roman Catholic Tübingen school, founded by Johann Adam Möhler (professor, 1828–35), endeavored to increase friendly relations between the Roman Catholic and Protestant communions.

Tucson (tū-sŏn′), capital of Pima Co., Ariz.; on the Santa Cruz River; 121 m. SE. of Phœnix. It is in an agricultural, stock-raising, and mining region, and contains the Univ. of Arizona. The city was the site of an Indian pueblo and, 1867–77, was the capital of the territory. Pop. (1900) 7,531.

Tu′dor, family name of an English dynasty which occupied the throne from 1485 to 1603. The family was descended from Owen ap Tudor, an obscure Welsh gentleman, who about 1423 married Catharine of France, widow of Henry V of England. Their son, who was created Earl of Richmond, married Margaret, daughter and heiress of John Beaufort, Duke of Somerset, whose father was a son of John of Gaunt, Duke of Lancaster, but born out of wedlock. The Earl of Richmond was legitimated by act of Parliament, but was expressly excluded from the succession to the crown; but upon the failure of the real Lancastrian line, Henry, the second Earl of Richmond, was recognized by that party as their chief. He defeated Richard III at Bosworth Field in 1485, and assumed the crown as Henry VII, although without any legitimate right. He married Elizabeth, daughter of Edward IV, and thus united the pretensions of the rival houses of Lancaster and York. The sovereigns of the Tudor line were Henry VII (1485–1509), Henry VIII (1509–47), Edward VI (1547–53), Mary (1553–58), and Elizabeth (1558–1603).

Tues′day (*Tiw* [see Tyr], god of war + *dæg*, day), the third day of the week. The name originated as a translation of the Dies Martis (literally, Mars's day) of the later Roman pagans.

Tuge′la, river in Natal, a scene of operations in the Boer War.

Tuileries (Fr. pron., twēl-rē′), a palace formerly existing in Paris. The ground was originally occupied by tile works, whence the name of the palace, and was bought by Francis I in 1518. In 1564 Catharine de' Medici began the erection of the buildings. This, the original palace, which was later much altered, consisted of the central pavilion and the adjoining galleries, but not in their later form. Under Louis XIV the older parts of the palace were heightened. After the erection of the palace of Versailles the Tuileries was seldom used by the French kings until Louis XVI, in 1789, was compelled to remove the royal residence hither, and after that time the palace was the scene of the most stirring spectacles of the history of France. Napoleon I, Louis XVIII, Charles X, Louis Philippe, and Napoleon III resided here, and the palace was stormed and ransacked by the people August 10, 1792, July 28, 1830, and February 26, 1848. In May, 1871, it was finally destroyed by fire by the Communists. The long galleries of the Louvre, ending in the Pavillon de Flore and the Pavillon de Marsan, which flanked the Tuileries, connected the two palaces, and the pavilions named are sometimes considered as a part of the Tuileries, but they have been restored.

Tu′la, government of European Russia, bordering N. on the government of Moscow; area, 11,954 sq. m. One sixth of the surface is covered with forest, the rest is under tillage; around the capital are extensive iron and coal mines. Grain, hemp, flax, mustard, turnips, potatoes, tobacco, and hops are grown; sheep, cattle, and horses are raised. Breweries, distilleries, and manufactures of ironware are numerous. Pop. (1907) 114,733.

Tu′lip (the *Tulipa gesneriana* and other species), herbs of the lily family from central Asia, now everywhere cultivated for their beautiful flowers. Of this species fully 1,000 varieties have been catalogued, but there are hundreds of unnamed varieties. Conrad Gesner brought the tulip from Turkey to Augsburg in 1559. Haarlem, in Holland, is, and long has been, the principal seat of the production of tulip bulbs for the European and American markets. During the seventeenth century the value of tulip bulbs increased largely in Holland, and in some instances they were sold for 2,500 fl., and even, according to some writers, as high as 4,600 fl.

Early Tulip.

Late or Show Tulip.

Tulip Tree (the *Liriodendron tulipifera*), a beautiful forest tree of the U. S. belonging to the magnolia family. Its bark has tonic powers, and its wood is valued in house carpentry and carriage and furniture making. It is often incorrectly called poplar, and sometimes whitewood. It is a fine ornamental tree.

Tul'lius, Servius. See SERVIUS TULLIUS.

Tul'ly. See CICERO.

Tum'ble Weeds, the popular name of many species of herbaceous annual plants whose many branches curve upward so that the whole plant is globular in outline. When dead and dry they break off at the root and roll away before the wind, dropping their seeds here and there for many miles. They occur upon the prairies and great plains of N. America, in S. America, and Russia.

Tu'mor, in pathology, a swelling abnormal to the body; but in the usual sense inflammatory swellings are excluded, and the term is limited to distinct and abnormal growths apparently causeless and without purpose. The structure of tumors is in all cases but a reproduction of normal tissue, more or less faithfully simulated. The structure of tumors differs from that of the tissues which they simulate mainly in being of a less fully developed character, in being less regularly arranged, and in their tendency to undergo degenerative changes. Tumors are in some cases characterized by malignancy—that is, by a tendency to recur when removed and to spread throughout the system by portions being transferred from the original seat to other parts through the blood or lymphatic currents.

According to the structural classification, there are fibrous, bony, fatty, lymphatic, cartilaginous, and other types of tumors, called, respectively, fibroma, osteoma, lipoma, lymphoma, chondroma, etc. Practically every tissue and organ in the body has its counterpart in some tumor. The malignant tumors are those which have always attracted the greatest attention. Of these there are two large groups—the carcinomata, or cancers, and the sarcomata. The former are composed of epithelial cells arranged for the most part somewhat after the manner of glands; the latter are composed of ill-developed connective tissue. The cancers grow where there is normally epithelium, as in the breast, stomach, or womb; the sarcomata, where there is mainly connective tissue, as about bones, in tendons, and the like.

Numerous theories have been advanced to explain the cause of tumors. Some held that the new growth depended upon a general blood disease; others that local injury and irritation are the causes; others inclined to the view that some defective arrangement of tissue in fetal life leads to later outgrowths. In the case of certain growths in the lower animals, and perhaps in man, the parasitic theory has been substantiated; but the question is still undecided. While tumors are most dangerous in proportion to their malignant characters, a purely local and benign growth may at times be dangerous from the pressure it exercises. See CANCER.

Tu'mulus, an artificial mound used for burial purposes; the largest are the ancient tombs of the mikados of Japan. Such prehistoric mounds are found in most parts of the world. See BARROW.

Tun'dra, a type of treeless, moss-covered plain, bordering the Arctic Ocean in Siberia and N. America. The tundra is an undulating, swampy country, covered with mosses, lichens, and small but bright and beautiful flowering plants, with a few ferns and rushes. The monotonous surface is dotted with lakelets, and is sometimes broken by mountains and hills. The tundra is formed by the growth of vegetation above and its partial decay and accumulation below. The preservation of the vegetable matter is due to the fact that below the depth of about a foot the peaty soil is always frozen. As the thickness of the vegetable layer increases by growth above, the surface of the continually frozen layer rises. Large rivers flow through the tundras, and in their banks a depth of from 100 to 300 ft. of ice and frozen soil is sometimes exposed. The bones of extinct animals are frequently found in these deposits, and in Siberia the carcasses of the hairy mammoth and woolly rhinoceros have been found entire. In Alaska, on the border of Bering Sea, the tundra has a breadth of about 100 m., but it increases in width along the shore of the Arctic Ocean, and in Asia is of still greater extent. The entire area of these frozen bogs is from 300,000 to 400,000 sq. m.

Tung'sten, a rare metal obtained from the mineral wolframite found in Cornwall, England, Saxony, Monroe, and Trumbull, Conn., etc. It has a gray luster, and its compounds are not poisonous. A class of compounds called tungsten bronzes have bright colors and metallic luster, and are used as bronze-powder substitutes. Tungstate of sodium is used as a mordant in dyeing, and to render muslin fire resisting. Tungsten alloys with iron and steel are unusually hard.

Tungsten has recently come into use in the manufacture of the filaments of incandescent electric lamps. It is especially valuable because of the high degree of candle power obtained at a minimum expenditure of current. The average life of the multiple tungsten lamp can be taken at 1,000 hours, and that of the series tungsten, extensively adapted for street lightning, at about 1,500 hours, maintaining in each case a remarkable degree of candle power throughout its life. The fragility and the high cost of the tungsten lamp at present rather limit its usefulness.

Tungus'es, a Mongolian tribe, inhabiting Siberia from the Yenisei eastward to the territory of the Chukchees and to Sakhalin; the Manchus are of Tungusian stock. The Tunguses have flat faces, olive complexion, no beards, straight black hair, and oblique eyes. They are nomads, and divided, according to the beast of burden which they principally employ, into reindeer, horse, and dog Tunguses. They are chiefly Shamanists; they number in Siberia 70,000.

Tu'nic, an ancient form of garment in constant use among the Greeks. Among the Romans the tunic was an under garment worn by both sexes (under the *toga* and the *palla*), and was fastened by a girdle or belt about the waist. The term is also used ecclesiastically to denote a dress worn by the sub-deacon, made originally of linen, reaching to the feet, and then of an inferior silk, and narrower than the dalmatic of the deacon, with shorter and tighter sleeves.

Tunica'ta, a group of marine animals comprising the *sea squirts*, so called because they throw out little jets of water when irritated. They are interesting because they connect the great division of vertebrates with the invertebrates, and illustrate in their life history the possibilities of degeneration. The larva resembles a tadpole, has gill slits, a rudimentary spine, and other marks of the vertebrates. But after a short, free-swimming life it fastens itself to some solid support, and its structure degenerates, the body shortens, the outside becomes smooth, the nervous cord is contracted, and all characters pointing to the vertebrates are lost. *Salpa* is especially interesting from the fact that it was the first instance known of alternation of generations, and was discovered by the poet Chamisso. From each egg there develops a "solitary form" which is without sexual organs. In the body of this a stolon arises and becomes divided into distinct salps, each of which contains an egg. This second generation remains attached to each other through life, constituting the "chain form." The contained eggs undergo their development and give rise, in turn, to the solitary condition.

Tun'ing Fork. See SOUND.

Tu'nis, a French protectorate in N. Africa; bounded E. by Tripoli and the Mediterranean, W. by Algeria, N. by the Mediterranean, and S. by the Sahara; area, 45,716 sq. m. Cape Blanc is the northernmost point of Africa. The interior is traversed by the Great and Little Atlas, 4,000 to 5,000 ft. A number of shallow salt marshes in the SE. are below the level of the sea. The climate is dry and hot, and the soil produces large crops of wheat, maize, and barley; cotton, indigo, saffron, and tobacco are cultivated. Olive and date plantations are numerous and remunerative. Oxen, sheep, mules, and camels are the common domestic animals. Salt and lead are produced, though mining, like agriculture, is carelessly carried on. Some branches of manufacture, such as woolens, especially red caps, dyed skins, morocco leather, and coral, are developed, but declining. Pop. abt. 2,000,000, chiefly Bedouin Arabs and Kabyles.

Tunis occupies nearly the territory of ancient Carthage. With Sicily it formed the granary of Rome. On the dissolution of the Roman Empire it became a province of the Greek Empire, from which it was conquered by the caliphs of Bagdad. From the twelfth century to the sixteenth it formed an independent state, and became the terror of all the nations on account of its piracy, which did not cease until near the middle of the nineteenth century. In 1574 the country became dependent on Turkey. October 25, 1871, the bey obtained an imperial firman which made him virtually independent; but of this independence he was deprived by the French, who landed an army in 1881, and, under form of a treaty signed May 12, 1882, reduced him to a state of vassalage. The French resident is called *chargé d'affaires*, and practically administers the government of the country under the direction of the French Foreign Office.

Tunis, capital of the State of Tunis; near the Gulf of Tunis. Its streets are narrow, unpaved, and filthy, but its houses, though only one story high and presenting no windows to the streets, are substantially built, and many are finely fitted up in Oriental style. The palace of the bey and several of the mosques are fine edifices, and the bazaars are large and well stocked. Silk and woolen manufactures are extensively carried on; caps, shawls, turbans, and mantles, soap, wax, olive oil, and leather are also made and exported, and the transit trade between Europe and the interior of Africa is important. Pop. 227,519, of whom 50,000 are Jews.

Tunk'ers. See DUNKERS or DUNKARDS.

Tun'nels and Tun'neling. Tunnels are underground passages constructed without removing the earth or rock above. A roofed cut, such as the greater part of the New York subway or the railway "tunnel" leading from the Grand Central Station, New York, are not properly so called. Railway tunnels are preferred to open cuts, when the cost of the latter is greater; in other words, generally when the thickness of the material above is very great, say over 50 to 60 ft. The earlier railways avoided tunnels usually, on account of expense, but lines are now being shortened and grades made easier where possible, involving the construction sometimes of several within a short distance.

The cost of a tunnel and the method of driving it depend on the character of the ground. In solid rock the work is slow but simple. A heading or small advance section is generally driven, either at the top or the bottom of the passage. This is enlarged to full width, and the remaining rock taken out from above or below. In softer rock it may be necessary to use timber props as the work proceeds, and the tunnel is afterwards lined with masonry or with concrete. The rock is dislodged by blasting, the holes being drilled with compressed air, water, or electricity, and the explosive is generally nitroglycerin or some powerful nitro-compound, fired electrically, many charges at once. If compressed air is used its escape provides partly for ventilation, but machine fans or blowers are generally provided. Water is removed by pumps and drains. This sometimes accumulates in dangerously large quantities, and in deep Alpine tunnels hot springs may be encountered. The disposal of such floods taxes the skill of the engineer. Where the tunnel is not too far below the surface shafts are usually sunk from above, and the work is hastened by tunneling in both directions from the bottom of each.

If the material be soft earth, no blasting is necessary, but the mass above must be supported as the work proceeds. Timbers may be used throughout, and masonry or concrete put in after the excavation is over, or the lining may follow the bore very closely. In very soft ground, or in subaqueous mud or silt, a so-called "shield" is used—now generally a very short tube or ring of steel or iron plates closed by a partition of the same material with suitable doors. The material is excavated through these doors, and the shield is pushed ahead hydraulically as the work progresses. When the material is so soft as to flow, it is now generally kept back by maintaining a high air pressure so that the tunnelers work in a caisson, to which they have access through an "air lock." Quick transition from this high pressure to the open air, probably by suddenly releasing dissolved gases from the blood, gives rise to the serious and sometimes fatal "caisson disease," popularly called the "bends," the cause of which remained long unknown.

In soft mud, as the shield moves forward, sections or rings of iron are bolted in place behind it, so that the tunnel becomes an iron "tube," afterwards strengthened and protected with masonry or concrete. In the tunnel carrying the Pennsylvania Railway beneath the Hudson River at New York, this tube is to be supported by concrete piles extending down through the silt to rock. The tunnel is thus an "underground bridge."

In some cases the iron tubing for a subaqueous tunnel is constructed on land in sections of greater or less length, and sunk into place, the water being afterwards pumped out.

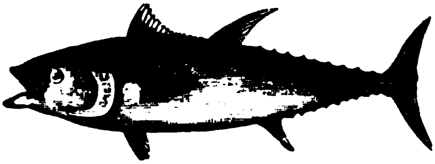
The earliest transportation tunnel is said to have been that of Malpas, on the Languedoc Canal in France, built in 1666–76; it is 767 ft. long. The first English and American tunnels were also on canals, the earliest in England being the Harecastle, on the Trent and Mersey Canal, 1766–77, 8,600 ft. long. The first in the U. S. was on the Union Canal, 1818–21, 450 ft. long.

The great rock tunnels of the world are the four Alpine tunnels, namely (in order of time), the Mont Cenis, 8 m. long (1857–70); the St. Gothard, 9¼ m. (1872–81); the Arlberg, 6½ m. (1880–84); and the Simplon, 12¼ m. (1893–1905). None of these was constructed with the aid of shafts. In this country the most important railway tunnel is the Hoosac, in Massachusetts, nearly 5 m. long, with a central shaft 1,028 ft. deep (1856–73).

The greatest subaqueous tunnels are now to be found in the vicinity of New York. The first to be opened to the public was that carrying the subway from Manhattan Island to Brooklyn across the East River (1907). As early as 1894, however, a tunnel for gas pipes had been completed several miles higher up the river to Astoria. The oldest of these New York river tunnels, counting from its origin, is the upper so-called "McAdoo" tunnel from Christopher Street, Manhattan, under the Hudson to Hoboken. This was begun in 1880, and continued at intervals, as funds could be obtained, until abt. 1889, when the work was abandoned after building about 2,000 ft. The tunnel remained full of water for many years, when it was acquired by the Hudson Tunnel Company, completed and opened to the public in 1908. The same company constructed another tunnel to the foot of Cortlandt Street, which was opened the following year. Both these consist of parallel but generally separate tubes. In the earlier set the old construction in the north- or west-bound tunnel is easily recognized from its masonry lining and oval shape. The railway tunnels to carry the Pennsylvania road under the Hudson into New York and across under the E. River to Long Island City are completed, but not yet equipped, although an experimental train ran through them late in 1909.

Some interesting American aqueduct tunnels are the one conveying Croton water to New York City; the Chicago water tunnels, to obtain pure water from Lake Michigan 4 m. from shore, and the Cleveland Lake Erie Tunnel. Probably the most interesting tunnel ever projected is the Channel Tunnel, planned to pass from England to France under the Straits of Dover, 21 m. It is believed to be practicable, but permission to construct it was refused by Parliament, through fear that it might be used by an enemy in case of invasion. See ENGINEERING.

Tun'ny, the largest member of the mackerel family, known on the coast of the U. S. as the horse mackerel. It is a heavily built fish, tapering rapidly to the pointed head and slender base of tail. It reaches a length of 9 or 10 ft., and a weight of 1,000 lb. The tunny occurs on both sides of the Atlantic, and ranges to Tasmania, and has been the object of extensive fisheries in the Mediterranean from time immemorial.



AMERICAN TUNNY.

Tu'pelo. See GUM TREE.

Tupis, or **Tupys** (tô-pēs'), general name for numerous Indian tribes of Brazil. They were all agriculturists, and had fixed villages; but went naked, painting their bodies. In some tribes prisoners of war were sacrificed and eaten. Their descendants, mixed with negro and white blood, form the bulk of the country population.

Tup'per, Sir Charles, 1821– ; Canadian statesman; b. Amherst, Nova Scotia; graduated as a physician at Edinburgh in 1843. He was appointed governor of Dalhousie College, Halifax, 1862; president Canadian Medical Association, 1867–70. He represented Cumberland in the Nova Scotia Assembly, 1855–67; same constituency in the Parliament of Canada, 1867–84 and 1887–88; member of the Executive Council and Provincial Secretary of Nova Scotia, 1857–60 and 1863–67; and Prime Minister of that province, 1864–67. He was president of the Privy Council of Canada, 1870–72; Minister of Inland Revenue, 1872–73; Minister of Customs in 1873; Minister of Public Works, 1878–79; Minister of Railways and Canals, 1879–84; and Minister of Finance, January 27, 1887, until May 24, 1888, when he was appointed High Commissioner for Canada in London. He was knighted in 1879, and made a baronet in 1888. In April, 1896, he succeeded Sir Mackenzie Bowell as Premier of Canada, but held office only until July, when the Liberals came into power with Wilfrid Laurier as Premier. He retired to private life in 1900. In 1907 he was made a member of the Imperial Privy Council.

Tupper, Martin Farquhar, 1810–89; English poet; b. London; educated at Charterhouse School and Christ Church, Oxford; studied law, and was called to the bar, but never practiced; in 1838 issued the work by which he is best known, "Proverbial Philosophy" (second series, 1842; third, 1867). This had a prodigious circulation in England, and over 500,000 copies were sold in America. It was a commonplace piece of work, and Tupper became a favorite butt for the ridicule of the critics and a proverb for platitude and inanity. He wrote other volumes of prose and verse.

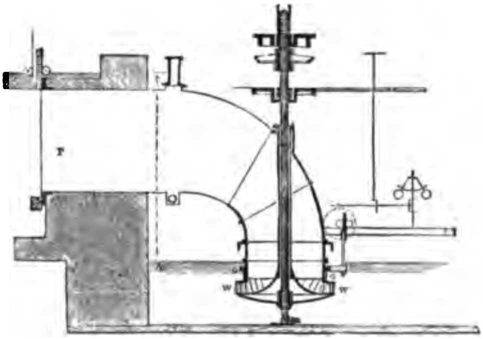
Tura'nian Lan'guages. See LANGUAGE.

Tur'ban, a form of headdress worn by the Orientals. It varies in form in different nations and different classes of the same nation. It consists of two parts: a cap without brim, fitted to the head, and a sash, scarf, or shawl, usually of cotton or linen, wound about the cap, and sometimes hanging down the neck.

Tur'bine, a wheel in which water or steam enters and leaves at all points around the circumference, acting both by impulse and reaction. Water turbines are usually horizontal wheels turning upon a vertical axis, although some forms are vertical, turning upon a horizontal axis. One of the earliest of these devices, known as Barker's Mill, was a reaction wheel, but rather an inefficient one.

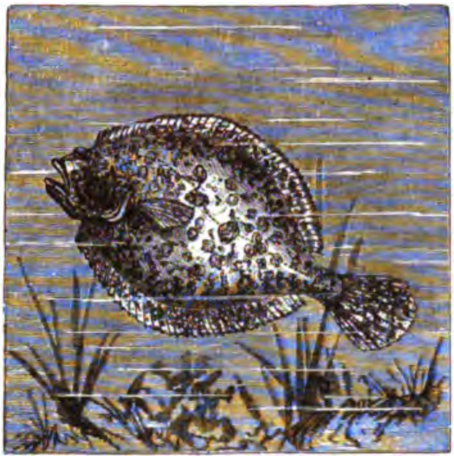
It consisted of a hollow wheel with spouts protruding from the circumference. The spouts were bent back somewhat at right angles to the diameter. The wheel was mounted on a vertical shaft, which was surrounded by a hollow casing connected with the wheel, through which the water was led to the wheel and out through the spouts, by its reaction causing the wheel to revolve. The first efficient turbine was invented by Fourneyron, in France, in 1833. A modification of this wheel, which has been extensively used in the U. S., was invented by Boyden. A vertical section of the Boyden turbine is shown in the diagram. The water approaches the wheel through the penstock P, and is given a rotary motion by the fixed guides G, radiating outward from the center of the wheel. Vanes W are rigidly fixed to the outer part of the wheel, which, being free to move while the inner part is stationary, the water, directed by the guides G, impinges upon the vanes W nearly at right angles and by its impulse and reaction causes the wheel to revolve.

The theoretical work of the water turbine is ascertained by multiplying the weight of the water passing through it by the height in feet through which it falls. The work actually utilized is between 70 and 80 per cent of the theoretical work, the balance being lost in overcoming friction, in foam, and in leakage. Turbines of the kind described are known as outward-flow wheels. Another common type of wheel reverses the operation and the flow of water takes place from the outer part to the inner part of the wheel, which is movable, while the outer part is stationary. Turbines of inward and downward flow, having the wheel vanes made up of warped or curved surfaces, are also common. In these the water enters horizontally through fixed guides, but after entering the wheel the curved surfaces of the vanes give it also a downward direction. Another class of wheels is that of downward or parallel flow, in which the water moves downward without approaching or receding from the axis. This form is frequently called the Jouval. The regulation of the speed and power of water turbines is effected by means of a gate for shutting off the water, and also by a governor. Several water turbines of 5,000 horse power each were installed at Niagara Falls in 1894 and 1895, and a number of others since that time.



The development of a successful steam turbine is of recent date. The steam turbine is a wheel driven by the impact of steam, moving at high velocity, upon vanes or blades attached to the circumference of the wheel or disk. Its two essential parts are a wheel and its axle mounted in a suitable casing in which the axle is supported. A very large number of small curved vanes are set in the circumference, and a number of nozzles set at several points around the circumference direct the steam in a small jet against these vanes or blades. The equivalent of compounding is obtained by allowing the steam to act on one set after it has acted on the one next to it, and so on. After passing through several such stages the steam finally passes to the exhaust. Steam turbines have given results in the development of power about equal to those of high-class reciprocal steam engines, on same steam consumption.

Tur′bot, a large flatfish of the North Sea and adjacent waters; highly esteemed as a food fish. It is, next to the halibut, the largest flatfish of European waters, reaching a length of 3 ft. and a weight of 30 or 40 lb. The general color is brown, with lighter shadings. The true turbot does not occur on the coasts of N. America, but the name is bestowed on some medium-sized flounders of indifferent flavor.



European Turbot.

Turenne (tü-rĕn′), **Henri de la Tour d'Auvergne** (Vicomte de), 1611–75; French soldier; b. Sedan; entered the French army, 1630. During the Thirty Years' War he distinguished himself in the campaigns in Germany and Italy; received an independent command in 1641; conquered Roussillon in 1642; marshal of France in 1644, and contributed much to the conclusion of the Peace of Westphalia in 1648 by his successful campaigns in Germany and Flanders. In the wars of the Fronde he first sided with Condé, but, having been defeated at Rethel in 1650 and driven out of France, he became reconciled with the court; was appointed commander in chief of the royal troops, defeated Condé at Gien, and nearly destroyed his army at the Faubourg St. Antoine in 1652, the Spaniards at Arras, 1654, and Condé and the Spaniards in the Dunes, 1658, and was made a marshal general in 1660. In the War of the Spanish Netherlands (1667) he conquered Flanders in a brilliant campaign, and in the war with Holland (1672) his fame reached its culmination by his devastation of the Palatinate in 1674 and the victories at Sinzheim (1674) and Türkheim (1675). He was preparing for a last and decisive encounter with Montecuculi, when he was killed by a cannon ball during a reconnaissance near Sasbach, July 27, 1675. He is considered the greatest general France has produced, next to Napoleon.

Turgéneff (tôr-gĕn′ĕf), **Ivan Sergeevich,** 1818–83; Russian novelist; b. Orel, Russia. In 1852 for his "Letter on Gogol," although it had been passed by the Moscow censor, he was arrested and banished for two years. From 1863 to his death he lived abroad, chiefly at Baden Baden and Paris. Still he made frequent visits to Russia. In his ideas he was an admirer of W. Europe, for which, and for his residence in a foreign country, he was attacked by Slavophils. Turgéneff made his literary début with some verses (1841), but, though he wrote several pretty pieces, he does not rank high as a poet. His dramatic attempts, too, were failures. His earliest prose story, "Adreī Kolosov," did not attract attention, but its successors were more fortunate. In 1847 appeared "Khor and Kalinych," the first of his "Zapiski Okhotnika" (Tales of a Sportsman), which continued for four years and put him in the front rank of living authors. These were followed by other stories and sketches almost equally successful: in 1852 "Dimitri Rudin," the first one long enough to be called a novel; in 1859 "Dvorīanskoe Gnesdo" (A Nest of Noblemen, in some translations called Lisa); in 1862 "Nakanune" (On the Eve, in some translations Hélène); in 1862 "Ottsy i Deti" (Fathers and Sons), perhaps his masterpiece; in 1867 "Dym" (Smoke); in 1877 "Nov" (New, in some translations Virgin Soil), and many smaller pieces, the last of which his exquisite "Poems in Prose," came out only just before his death. As a writer Turgéneff is characterized by keen realistic insight into the weaknesses of mankind, always showing a lurking sympathy and tenderness. His characters are vivid and true to life, while his appreciation of the beauties of nature is profound. None of his stories is long. They have perfect unity, cohesion, and in both substance and style the finish of a great artist. They have been translated into many languages, into French largely by the author himself.

Turgot (tür-gō′), **Anne Robert Jacques** (Baron de l'Aulne), 1727–81; French statesman and economist; b. Paris; was educated for the Church, but gave up the ecclesiastical career in 1751; studied law and economics; became noted as a liberal thinker and an advocate of religious toleration, and wrote several essays for the "Encyclopédie." In 1761 he was appointed intendant, or governor, of the province of Limousin. His administration was successful, and, although his reforms were crippled by the egotism of the privileged classes and the stupidity of the unprivileged, they proved beneficial. In 1774 Louis XVI appointed him Comptroller-General of France—that is, Minister of Finance—and he immediately went to work to save, if possible, the state from bankruptcy. His ideas were essentially the same as those carried out by the revolution, and the courtiers, the nobility, the clergy, etc., raised a storm around him. For some time the king supported him faithfully. Although he said he himself and Turgot were the only two who loved France truly, yet he suddenly dismissed him in May, 1776. Turgot retired, occupying himself with scientific researches. His "Œuvres complètes" include his essay on usury, on the best method of taxation, and "Réflexions sur la Formation et la Distribution des Richesses," etc.

Tu'rin (Italian, TORINO), chief city of Piedmont, Italy; on the left bank of the Po. It is an industrial city, and makes silks, ribbons, lace, and bonnet goods; also matches, leather, and tools. Its situation is picturesque. The town is so regularly laid out and built with so much uniformity as to be monotonous. The only building representing the architecture of the Middle Ages is the Madama Palace. The churches are numerous, but not interesting. The city is rich in monuments raised in honor of celebrated Italians. The university is, next to that of Naples, the most frequented in Italy. The Egyptian museum of the Academy of Sciences is one of the best in the world, and the Academy of Fine Arts and the Royal Museum of Arms have fine collections. The climate of Turin is salubrious, but variable. The winter is cold and the spring inconstant. It is the fourth city in size in Italy, modern in character, agreeable and full of business, rapidly growing, and affording charming sites for further expansion. Pop. of commune (1901) 335,656.

Turin owes its origin and name to a Celtic-Illyrian tribe, enemies of the Etruscans and allies of Rome. Cæsar established the colony from which the city grew, calling it Colonia Julia, afterwards changed by Augustus to Colonia Augusta Taurinorum. Lying near the border of Italy, it has undergone many vicissitudes. It was the political capital of the duchy of Savoy, and later of the Kingdom of Sardinia from the Napoleonic occupation to 1861, and from 1861 to 1865 capital of the Kingdom of Italy. With the removal of the capital to Florence, and then in 1871 to Rome, it received a brief check to its prosperity, since overcome

Turkestan, or **Túrkistán** (tôr-kĭs-tăn'), a name of varying signification, political, linguistic, or geographic, but also centering about the great interior basins of Asia, generally those of the Tarim River, of Lake Balkash, and of the Sea of Aral. The name is passing into disuse as a general term, but is still employed to designate Chinese and Russian Turkestan. By Chinese Turkestan, sometimes E. Turkestan, is meant the basin of the Tarim, comprising all the S. part of the immense district called Kansuh-Sin-kiang by the Chinese. It is mostly a desert. The Russian government of Turkestan was formed in 1867, and now consists of the provinces of Syr-Darya, Ferghana, and Samarkand. Area, 257,134 sq. m.; pop. 5,000,000 to 6,000,000. The capital is Tashkend. The next cities in importance are Samarkand and Khojend. The population is chiefly nomadic and pastoral.

Tur'key, or **The Ot'toman Em'pire,** an empire comprising large portions of Europe, Asia, and Africa, and having its political center and capital at Constantinople, on the Bosporus. Area, 1,565,000 sq. m. Turkey in Europe occupies the central portion of the Balkan Peninsula. It is bounded N. by Bosnia, Servia, and E. Rumelia, E. by the Black Sea and Bosporus, S. by Greece, the Ægean Sea, the Dardanelles, and Marmora; W. by the Adriatic and Ionian seas. It includes also the island of Thasos. Turkey in Asia comprises the Sporades Islands, in the Ægean, Asia Minor, Crete, the vast basins of the Euphrates and Tigris, Syria, and the W. coast of Arabia. It is bounded N. by the Dardanelles, Marmora, Black Sea, and Russia; E. by Russia, Persia, the Persian Gulf, and Arabia; S. by the Mediterranean, the Gulf of Aden, and Arabia, and W. by the Red, Mediterranean, and Ægean seas. Turkish Arabia, or El Hedjaz and Yemen, is a strip of land nearly 1,000 m. long and of indefinite breadth, extending along the Red Sea. Turkey in Africa comprises Tripoli and Barca. It is mainly included between the Mediterranean and the Great Desert. Its inland boundaries are indefinite. Turkey in Europe possesses an extensive coast line, with many harbors, terminating toward the SE. in the commanding peninsula inclosed by the Black Sea, the Bosporus, and Marmora. The general surface is broken and mountainous. The coast of Turkey in Asia is long, sinuous, and abounding in gulfs with natural harbors. From the great plateau of Armenia, which spreads in every direction around Ararat (17,212 ft.), the Antitaurus Mountains and Taurus Mountains extend W. and SW. Turkey in Africa has few good harbors. A belt of fertile land borders the coast, but farther S. are sandy plains and ranges of rocky mountains. The most important rivers in European Turkey are the Maritza, the Boyana, and the Drin. In Asia Minor there are few great rivers, and all are winding. The most important in the empire are the Euphrates, 1,750 m., and Tigris, 1,000 m., both of which rise in the plateau of Armenia and finally unite as the Shatt-el-Arab, which empties into the Persian Gulf. In Africa the rivers are small and often dry.

The system of agriculture is most primitive, although the soil for the most part is very fertile. The principal products are tobacco, cereals of all kinds, cotton, figs, nuts, almonds, grapes, olives, and all varieties of fruits. Flour milling in Smyrna is being improved and extended. Coffee is grown in the Hodeida region and opium in Konia. Tobacco is grown both in European and Asiatic Turkey, 237,657 metric tons being sold in 1907–8. In 1907–8 vine growers produced 67,891,648 kilos of wine and the distillers 8,705,310 kilos of spirits. In the provinces of Brussa and Ismid the production of cocoons in 1907–8 was 7,225,748 kilos; the quantity of raw silk consumed in local industries was 11,976 kilos. In Palestine an interesting feature in agricultural development is the establishment of Jewish and German colonies, which produce chiefly cereals, oranges, and various fruits.

The Turkish provinces, especially those in Asia, are rich in minerals, which are little worked, the principal ores being chrome, silver-lead, zinc, manganese, antimony, and copper. Borax, meerschaum, emery, and asphalt are also found in Turkey, as well as coal and petroleum. The salt mines at Salif, in the Yemen, yield a large output, the quantity sold in 1907–8 amounting to 326,920 metric tons.

Both gold and silver are found in the Smyrna sanjak; mercury near Smyrna and Konia; kaolin in the island of Rhodes; arsenic in Aidin; iron in Aidin, Konia, and Adana. Near Brussa quarries of lithographic stone are now extensively worked. There is a good deal of brass turning and beating of copper. Concessions have also been granted for glass manufactories, paper mills, and textile looms. At Damascus about 5,000 hand looms and 10,000 workmen are employed in weaving silk, cotton, and woolen fabrics. Carpet weaving is carried on in Anatolia. The fisheries of Turkey are important, those of the Bosporus alone representing a value of upward of $1,250,000. The coast of the Mediterranean produces excellent sponges, the Red Sea mother-of-pearl, and the Persian Gulf pearls.

The fundamental laws of the empire are based on the precepts of the Koran. The will of the Sultan is absolute, in so far as it is not in opposition to the accepted truths of the Mohammedan religion. The constitution of 1876, which save for a brief season has been inoperative, provided for the security of personal liberty and property, for the administration of justice by irremovable judges, the abolition of torture, the freedom of the press, and the equality of all Ottoman subjects. Islam was declared to be the religion of the state, but freedom of worship was secured to all creeds, and all persons, irrespective of religion, were declared eligible to public office. Parliament consists of two houses—a chamber of deputies and a senate. Senators must be at least 40 years of age, and are appointed by the Sultan. For the election of deputies one electoral delegate has to be chosen for every 600 electors, and these electoral delegates choose one deputy for every 6,000 electors. Electors must be Ottoman subjects of at least twenty-five years of age, without distinction of race or creed, while delegates must be at least thirty years of age. In consequence of the prevailing discontent, especially in the army, caused by corruption and misgovernment, an imperial decree was issued for the convocation of a parliament, and constitutional government was restored in 1908.

The whole of the empire is divided into vilayets, these subdivided into sanjaks, these into kazas, with occasional subdivision into nahies. A vali, or governor general, representing the sultan, and assisted by a provincial council, is placed at the head of each vilayet. The minor provinces are subjected to inferior authorities (mutessarifs, kaīmakams, mudirs, and muktars), under the superintendence of the vali. The division of the country into vilayets has been frequently modified of late for political reasons. For similar reasons six of the sanjaks of the empire are governed by mutessarifs appointed directly by the Sultan, and are known as mutessarifats, reporting direct to the Ministry of the Interior. Military service is incumbent on every Mussulman subject twenty years of age. Non-Mussulmans pay the haratch (tax) of about 30 piasters, and are not liable. The army is organized in seven ordus (*corps d'armée*). The government believes the army to number 250,000 in time of peace, and claims ability to put over 1,000,000 men into the field. On paper the navy is formidable, yet most of the ships are so poorly equipped and unseaworthy, the crews so incompetent, and the commanders so incapable that the Ottoman navy hardly counts as a fighting power.

The great majority of Turkish subjects may be classed in seven main racial groups: Turkish, Græco-Latin, Slavic, Georgian, Hindu, Persian, and Semitic. The population of the empire is estimated at about 35,414,300; that of Turkey in Europe is about 6,130,200. The chief towns are: In Albania, Scutari, Janina; in Macedonia, Salonica, Monastir; in Thrace, Constantinople, Adrianople; in Asia Minor, Smyrna, Broussa, Adana; in Armenia, Erzeroum, Erzinghian, Van; in Kurdistan, Mosul, Kharpout, Diarbekir; in Irak Arabi, Bagdad; in Arabia, Mecca, Medina; in Africa, Tripoli. Education has made marked progress since about 1850, due to the efforts of the government, to the awakened sentiment of the people, and to the missionaries. The imperial school of medicine, founded in 1826, has been followed by colleges and other high institutions and by primary and secondary establishments.

The Turkish Govt. publishes neither financial account nor estimates of revenue and expenditure. The estimates presented to the Chamber, 1909, show for the year 1909–10 revenue amounting to $111,298,664 and expenditure amounting to $128,041,416. The condition of the Turkish debt was as follows in 1908:

Secured on Egyptian tribute	$82,735,250
Secured on administered revenues	330,862,320
Various loans	47,297,448
Total	$460,895,018

Of debts which are not loans, the most important are the balance of the Russian war indemnity, amounting to $107,857,200 in 1898, and a debt of $1,203,373 for the Damascus Railway. The decimal system of weights and measures was introduced in 1882 and declared obligatory in 1892. A tax of 11 per cent ad valorem is levied on all imports, except articles for embassies, consulates, schools, and churches, which are admitted free. The introduction of salt and tobacco is prohibited, they being government monopolies. There is an export customs duty on native goods sent abroad and between the different provinces of the empire. The chief imports are linen goods, sugar, woolen goods, medicines and dyes, coffee, rice, petroleum, skins, iron, cashmere, and timber. The chief exports are raw silk, opium, mohair, nuts, coffee, figs, cotton, minerals, olive oil, carpets, cocoons, and eggs.

The Ottomans are a Turkish tribe, originally from Khorassan. Numbering only 400 families, they were led by their chief, Ertogroul, into Asia Minor in 1231. The Seljuk sultan, Ala-ed-Din I, grateful for aid in battle, bestowed on Ertogroul some pasture lands on the river Sangarius, E. of the Bithynian Olympus. There Ertogroul and his followers, hitherto pagans embraced Islam, and their descendants have continued faithful and zealous Mussulmans. On the dissolution of the Seljuk Empire, Othman, son of Ertogroul, was proclaimed sultan of the Ottomans, and his possessions slowly increased. At that time Asia Minor presented a ready field of conquest to whichever power was stronger than the rest, and the first seven sultans possessed the qualities requisite to the founding of states. Broussa was besieged and made the capital, 1325.

A code was formulated, the janizaries and sipahis (cavalry) organized, money coined, and red adopted as the national color before 1330. Tzympe, the first Ottoman acquisition in Europe, was captured, 1359; then Adrianople, 1365. Gradually Asia Minor and the Balkan states were subdued. The frightful defeat of Bayazid I at Angora by Tamerlane, 1402, and the consequent eleven years' interregnum, threatened the very existence of the empire. Yet when Mohammed II succeeded, 1451, it had already become more strong and compact than before. The Seljuks, as fast as they were subdued, fused with the Ottomans, as did vast numbers of Christians. Duration was assured the empire by the capture of Constantinople, 1453, which was at once made the capital. Under Mohammed II, Bayazid II, Selim I, and Suleiman I the empire steadily expanded, reaching its acme in the reign of the last. The unsuccessful siege of Vienna, 1529, and of Malta, 1565, were its first real checks. Their empire in the sixteenth century was the most powerful in the world.

Yet already the empire was beginning its slow but inevitable decline, due chiefly to the fact that the Ottoman Empire has always consumed and never produced; has lived on the countries which it conquered without conferring any benefits upon them. After the decline began, subsequent fruitless conquest and infrequent victories only varied the monotony of such irreparable disasters as Lepanto and Plevna. The whole humiliating history is best indicated by the successive treaties of Sivatorok, 1606, when the empire first receded; Carlovitch, 1699, by which it was first dismembered; Passarovitch, 1718; Kainarji, 1774; Jassy, 1792; Adrianople, 1829; San Stefano, 1878; and Berlin (see TREATY OF BERLIN). In 1908 Bulgaria became independent and Bosnia and Herzegovina were annexed to Austria-Hungary. In 1909 the old absolute monarchy was overthrown and Abdul Hamid deposed. Mehmed V was chosen as the new sultan and a constitutional monarchy established.

Turkey, a bird allied to the common fowl, domesticated in many civilized countries, but confined to N. America until after its discovery by Columbus. It was found in the forests from the Isthmus of Darien to Canada when the country was first settled, being then abundant even in New England.

Turkey Buz'zard, the commonest of American vultures, resembling a turkey in size and appearance. It is 2½ ft. in length and 6 ft. in spread of wing; the general color is blackish, lighter on the wing coverts; head and upper part of neck bare and reddish. It ranges throughout the greater part of the U. S., except the extreme N. and E. portions, and thence S. over nearly all of S. America. It feeds on carrion, and is remarkable for its sustained sailing flight. It must not be confounded with the smaller black vulture, or carrion crow.

TURKEY BUZZARD.

Turkey Stone, or Turkey Oil'stone, a flinty rock of very fine grain used for sharpening cutting tools; so called because obtained from Asia Minor. See HONE.

Turkistan'. See TURKESTAN.

Tur'komans, certain tribes of Turkish tongue scattered through Transcaspia, Turkestan, Persia, Khorassan, W. China, and Turkey in Asia. Their language is very similar to Osmanli Turkish, but physically they are much modified by Iranian intermixture. They are all zealous Sunnite Mohammedans, and are pastoral and nomadic.

Turks, in the broad sense, a race with definite and well-marked ethnic and linguistic characters which has played an important part in the history of central Asia and E. Europe, and is now found scattered over a territory stretching from Yakutsk to N. India and W. to the Mediterranean and Lithuania. It occupies but a part of this great territory, has extensively intermingled with Aryan and Mongol races, and comprises many different tribes.

Turks Is'lands, a group of small islands (Grand Turk, Salt Cay, and some islets); physically, the SE. of the Bahama group, but politically, with the neighboring Caicos Islands, attached to the colony of Jamaica. All are low, and Grand Turk, the largest, is only 7 m. long by 1½ m. wide. Several lagoons furnish excellent salt, and about 1,500,000 bu. are annually exported. Total pop. Turks and Caicos Islands (1905) 5,287, nearly all engaged in the salt industry.

Tur'meric, the root of *Curcuma longa* of the ginger family, a native of the E. Indies and Cochin-China. It contains a yellow coloring matter (*curcumin*) and a brownish dye. The root of *Canna speciosa*, a plant occurring in W. Africa, also possesses the same properties.

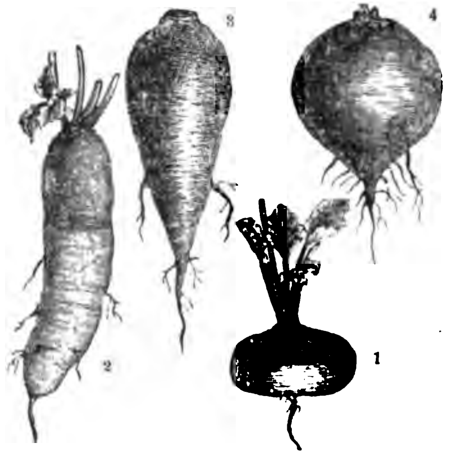
Turmeric is used in the dyeing of silk and wool, and unsized paper stained with a solution of turmeric is used in chemical operations as a test for the alkalies, which impart a reddish-brown color to the paper.

Tur'ner, Joseph Mallord William, 1775-1851; English landscape painter; b. London; entered the school of the Royal Academy in 1789, and drew from nature in pencil and water color. He was elected a Royal Academician in 1802, and soon afterwards traveled in France, Italy, and Switzerland. In 1807 he began his "Liber Studiorum"; in 1819, visited Italy, to which country he returned in 1829 and 1840. He had a most successful artistic career and received many honors. He left his pictures to the nation, the National Gallery in London thus acquiring over a hundred finished works. His work was enthusiastically championed by John Ruskin, who wrote eloquently about his methods and his faithful study of nature, and exalted him at the expense of Claude Lorraine, who was considered the greatest of landscape painters at the time when Turner began to be known. Turner was a man of great talent and singularly gifted as a colorist, his chief claim to rank high as an artist depending on the fine color quality of his works. In his later work he paid little attention to form, and occupied himself almost entirely in working out elaborate color schemes, for which almost any subject served his purpose.

In the National Gallery, London, are a large number of oil paintings by Turner, most of them coming from his bequest to the nation. Among these are "The Garden of the Hesperides," "Crossing the Brook," "Ulysses Deriding Polyphemus," "The Fighting Téméraire," "Snow Storm," "Steamer Signaling," and "Rain, Steam, and Speed." "The Sun Rising in a Mist" and "Dido Building Carthage" were left to the nation with the express proviso that they should be hung beside the two large pictures by Claude Lorraine, "Landscape with Figures" and "The Embarkation of the Queen of Sheba." Turner produced some remarkable engravings, the chief of which are the set known as "Liber Studiorum." Their general character is that of an etching in line, very carefully and skillfully made, as the framework of the composition, the plate being then mezzotinted; but some few of the plates were engraved in different ways. Engravings after Turner's pictures and water-color drawings were made in great numbers, on a large and also on a very small scale. Among the prints may be named the "England and Wales," the "Yorkshire Series," the "Harbors of England," and the exquisite illustrations to Rogers's "Italy" and "Poems."

Turn'ing. See Lathe.

Tur'nip, a biennial plant, abundant throughout the temperate zone, having a swollen, fleshy root of great value as food both for man and for cattle. It is found growing wild as a weed in Europe and N. Asia, and is largely cultivated, sometimes reaching 20 or 25 lb. Turnips, when grown in gardens, may be sown early; when raised in the field, they are sown much later, and thrive best in moist, cloudy weather. Though turnip culture is of recent origin in Great Britain, it has taken rank there as a field crop, being fed to sheep in the fields. Though an agreeable food for man, it has never assumed importance, owing to the large proportion of water, 87 to 92 per cent, in its composition. The ruta-baga, or Swedish turnip, is closely allied to it.



Varieties of Turnip. 1, red-top strap leaf; 2, cowhorn; 3, long white French; 4, ruta-baga.

Turn'pike, or Turnpike Road, a road, especially a highway, upon which turnpikes or toll gates are established, and which are kept in repair by the tolls or fees collected from those who use the road.

Turn'spit, a kind of dog, formerly employed for turning the spit upon which meat is roasted. The turnspit is a very intelligent dog, with a long body, short and often crooked legs, long and pendent ears, and a very large head. It has a dash of greyhound blood. Two or more dogs were kept, to relieve each other at the task, the dog standing in a kind of treadmill, his weight giving motion to the spit. The breed is apparently very old, as similar dogs are figured on the monuments of ancient Egypt.

Turnstone.

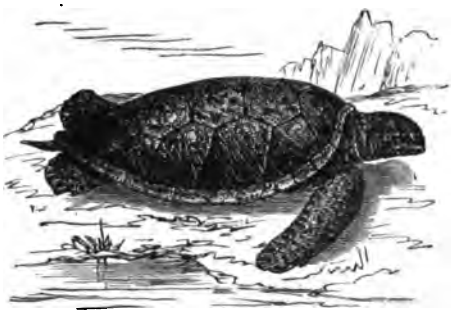
Turn'stone (so called from its habit of overturning stones in search of food), a wading bird allied to the plovers, and common on the shores of the U. S. and in nearly all parts of the world. On the Pacific coast is found the black turnstone.

Tur'pentine, any one of certain vegetable oil resins which exude from piny trees. They are obtained by making an excavation, having a capacity of about three pints, in the trunk of the tree, in which the juice accumulates, which is collected, washed with warm water, and purified by straining. American turpentine is chiefly procured from N. Carolina, S. Carolina, and Georgia. Venice turpentine is a ropy, slightly greenish liquid having a rather unpleasant odor and taste, and is made from the larch. Canada turpentine is produced from the balsam fir growing in Canada and Maine. The remaining varieties of turpentine are the Strassburg, the Hungarian, and the Chian, which are in most respects similar compounds. The turpentines as a class form yellowish viscid liquids, possessing a strong aromatic odor, and a bitter, pungent taste, and are very inflammable. They consist of a volatile oil (or oils) and rosin. Upon distilling the crude product with water, the volatile oil is separated, a brittle residue of rosin remaining.

Oil of turpentine (spirits of turpentine) ($C_{10}H_{16}$) is obtained by the distillation of crude turpentine. They all form colorless, mobile liquids of a peculiar disagreeable odor, are insoluble in water, but dissolve in alcohol and ether. The oils of turpentine are solvents of many resins and oils, of caoutchouc, and of iodine, sulphur, and phosphorus. French oil of turpentine consists essentially of a hydrocarbon termed *terebenthene* ($C_{10}H_{16}$). The oils of turpentine on standing slowly absorb oxygen, a portion of which is converted into ozone. Artificial camphors are the results of the combination of hydrochloric acid with oil of turpentine. Turpentine is sometimes applied externally in medicine in the shapes of salves and plasters; it is also taken internally in the form of pills. The oils of turpentine are used in varnishes, and to some extent in medicine.

Turquoise', or **Turquois,** a precious stone, chemically an aluminium hydrous phosphate, owing its blue color to a small amount of copper, always opaque and amorphous, and occurring in small seams in igneous and volcanic rocks. It has long been a favorite gem stone from its delicate light-blue color; when greenish it is less prized. The principal localities for turquoise are at Nichapur, Persia, and in the Sinai Desert in Egypt. The stones from the latter are more liable to change color. Since 1890 very fine gems have been obtained in New Mexico, where extensive mines have been reopened that were worked by the ancient Mexicans. Turquoise occasionally loses its color and turns greenish, especially when exposed to fatty acids, as in washing with soap water. A natural imitation, known as bone turquoise or odontolite, is fossil bone similarly colored by copper. It is easily distinguished under the microscope.

Tur'tle, one of an order of reptiles of the species *Testudinata,* with the body protected by a bony case. The jaws of turtles are toothless and hardened like those of a bird, and the feet modified for walking or swimming. Turtles are found throughout the tropical and temperate seas, and feed chiefly upon marine plants. The principal species is the green turtle (*q.v.*), which is highly esteemed as food. The *Trionychidæ,* or soft-shelled tortoises, are distinguished by the leathery and scaleless shell. "The principal habitat of the members of this family is the muddy bottom of shallow waters. They bury themselves in the soft mud, leaving only the head, or a small part of it, exposed. They take breath from time to time, without moving the body, by raising up the long neck and head, and carrying the leathery snout above water. They rarely emerge from the water, and when on the land their locomotion is laborious. In the water, however, they are active and quick in their movements. They feed upon shells; they lay from twelve to twenty and more eggs, of a spherical form and above the size of a musket ball, on the shore by the water's edge. The shell of these eggs is thick, but very brittle."—*Agassiz.* Species are found most abundantly in the tropical regions of Asia and Africa, but occur also through a large area of the U. S.



GREEN TURTLE.

While turtles are used for food wherever they are sufficiently large or abundant, few species are the object of regular pursuit. Among marine species the green turtles are taken for their flesh and the hawk-bills for their shells; the loggerhead is also taken, but forms poor food. The diamond back, or terrapin, of the SE. of the U. S. and the large species of sliders are much sought for, as are also the soft-shelled turtles of the S. of the U. S. and Mississippi valley.

Turtle culture has been practiced to some extent both in the U. S. and Japan. Florida claims the largest catch of the sea turtles and Virginia leads in the number of terrapin caught, although Maryland's product stands first in value, owing to the large proportion of diamond backs. The annual product of the turtle fisheries in the U. S. exceeds $120,000. See HAWKS-BILL TURTLE; LYRE TURTLE; TORTOISE.

Turtle, or **Tur'tledove,** any one of several small pigeons. The common European turtle is a migratory bird, famed for its gentleness, its strong conjugal affection, and its loud but pleasant cooing note. The turtle or mourning dove of the U. S. has a gentle and mournful note. It is 13 in. in total length, and has a remarkably long tail. There are perhaps twenty species of turtle dove. That mentioned in the Bible is *Turtur risorius*, an abundant Eastern species often kept in cages.

Tusa'yan In'dians. See SHOSHONEAN INDIANS.

Tus'cany, a compartimento of Italy, comprising the provinces of Arezzo, Florence, Grosseto, Leghorn, Lucca, Massa-Carrara, Pisa, and Siena; now not recognized as a legal division; area, 9,304 sq. m.; pop. (1908) est. at 2,675,451. It was formerly an independent grand duchy of Italy. Its territory corresponded nearly to that of ancient Etruria, and after the fall of the Roman Empire it formed at first part of the kingdom of the Goths, then of the kingdom of the Longobards, and then of the empire of Charlemagne. He gave it a somewhat more independent position, erecting it into a marquisate, and giving it away as a military fief. Guelph VI sold his fief in 1160 to the German emperor, Frederick I; but Tuscany was soon broken up into a number of independent republics, of which Florence, Pisa, and Siena were the most important. Florence conquered Pisa and the greatest part of the Tuscan territory, but was conquered itself in 1532 by Charles V, who appointed Alessandro de' Medici Duke of Florence. In 1569 Cosmo I united the whole of Tuscany into a grand duchy, and from that time to 1737, when it became extinct, the Medici family ruled the country, and made it one of the most prosperous and civilized in Europe. In 1737 it fell to Francis, Duke of Lorraine, who had married Maria Theresa and later became Emperor of Germany, and with the exception of a few years, during which Napoleon first made it a part of the Kingdom of Etruria, and then annexed it to France, it was ruled by the house of Lorraine until August 16, 1859, when it annexed itself to the Kingdom of Sardinia. In 1861, by a similar process, it was annexed to the Kingdom of Italy. From that time until 1871 Florence was the capital of the kingdom. The literary language of Italy is founded upon the dialect of Tuscany.

Tus'culum. See FRASCATI.

Tuske'gee, capital of Macon Co., Ala.; 40 m. N. by E. of Montgomery. It is in a cotton-growing region; is an attractive winter resort. It is noted for its educational institutions, which comprise the Alabama Military Institute, the Alabama Conference Female College, the Alabama Normal School, school for colored people, and the Tuskegee Normal and Industrial Institute. The last was founded in 1881 by Booker T. Washington, a graduate of the Hampton Normal and Industrial Institute. The institution is exclusively for colored youth, is equipped for advanced normal and industrial education, and nearly if not all of the work of laying out the grounds, erecting the buildings, and constructing the operating plants was done by the students. Mr. Washington has been principal of the institute from its organization. Pop. of town (1900), 2,170.

Tutui'la, the easternmost of the three larger islands of the Samoan group; area, 54 sq. m.; pop. 3,800. It is of volcanic origin, built up above the sea by basaltic rocks. The island is much smaller than Savaii and Upolu, farther W., but is not so mountainous. Pago Pago is the best harbor in the Samoan group. Tutuila came into the possession of the U. S. in January, 1900.

Twain, Mark. See CLEMENS, S. L.

Tweed, William Marcy, 1823-78; American politician; b. New York City; became prominent in local politics, and in 1853 was elected to Congress. For many years he was a member of the Tammany Society, of which he was grand sachem 1869-71. From his appointment as Deputy Street Commissioner in 1863 may be said to date the foundation of the Tammany ring, of which he was the chief spirit. As President of the Board of Supervisors, he increased the city's pay roll to unprecedented dimensions, giving sinecure positions to an army of political friends. The ring gradually grew till the opening of 1869 found it master of the state government. In 1868 the ring's greatest scheme of robbery, the building of a new county courthouse, was planned. The work was begun under the stipulation that the cost should not exceed $250,000. Before 1871 over $8,000,000 was pretended to have been expended on it and it was still unfinished.

When by the charter of 1870 the power of auditing accounts was taken from the Board of Supervisors and invested in certain city offices then filled by Tweed and his friends, all restraints on the system of plundering by fraudulent bills was removed. Such bills, amounting to $6,000,000, were passed by the board of audit at its first and only meeting. Of this amount over $1,000,000 was traced to Tweed's private pocket. A secret account of the money thus paid was kept in the auditors' office. During the winter of 1870-71 a clerk copied by stealth this account and the New York *Times* published it in July, 1871. The excitement created thereby started an investigation which resulted in the complete overthrow of the ring in the elections of November, 1871. Tweed was tried for grand larceny and forgery, and sentenced on November 22, 1872, to twelve years' imprisonment in the penitentiary and to pay a heavy fine. On December 4, 1875, he escaped and fled to Spain, where he was captured and returned to the city, November, 1876. Died in Ludlow Street Jail, New York.

Tweed, next to the Tay the largest river of Scotland. It rises in the SW. corner of Peeblesshire, at an elevation of 1,500 ft., flows NE., E., and again NE., and enters the North Sea at Berwick after a course of 97 m. It is tidal for 10 m., and forms a part of the border with England for 18¼ m.

Twi'light, the glow in the morning and evening sky caused by the reflection of the light of the sun by the atmosphere after sunset and before sunrise. If five minutes after sunset one could in a moment ascend to the height of half a mile above the earth he should again catch a view of the setting sun. All that portion of the atmosphere above this point is therefore in full sunlight, while that below it is illuminated by the reflection from other portions. Twilight is found to end entirely when the sun is between 15° and 18° below the horizon. One conclusion from the observations of twilight is that the atmosphere ceases to reflect the rays of the sun at a height of about 45 m. Did any part of the air higher than this reflect any light, it would be visible when the sun was more than 18° below the horizon, and thus there would be a longer twilight than we actually have. Near the equator twilight is short, as the sun quickly reaches 18° below the horizon; it increases toward the poles, and in the Arctic region lasts all night, as the sun does not then reach 18° below the horizon.

Tycho Brahe (tē'kō brä'ĕ). See BRAHE.

Tycoon, or **Taikun** (tī-kôn'), literally, "great prince," the name by which the Shogun of Japan was first known to foreigners. See SHOGUN.

Ty'ler, John, 1790–1862; tenth President of the U. S.; b. Charles Co., Va.; graduated William and Mary College, 1807; admitted to the bar, 1809; member of the state legislature, 1811–16 and 1823–25, and of Congress, 1816–21; voted to censure Gen. Jackson's conduct in Florida; opposed the U. S. Bank, the protective policy, and internal improvements by the National Government; Governor of Virginia, 1825–27; U. S. Senator, 1827–36; opposed the administration of Adams and the tariff bill of 1828; made a three days' speech against a protective and in favor of a revenue tariff, 1832; condemned the nullification measures of S. Carolina, but opposed Jackson's proclamation, and was the only senator who voted against the "Force" Bill; voted for Clay's Compromise Bill, and his resolutions censuring Pres. Jackson for the removal of the deposits, 1835; resigned from the Senate, February, 1836, because the Virginia Legislature instructed him to vote for expunging those resolutions from the Senate journal; was regarded as a martyr to the Whig cause, and as Whig candidate for Vice President in 1836 received the votes of Maryland, Georgia, S. Carolina, and Tennessee; sat in the Virginia Legislature, 1839–40.

He was elected Vice-President, November, 1840, and succeeded to the Presidency on the death of Gen. Harrison, April 4th; retained in office the Cabinet of his predecessor; expressed in a message to Congress his readiness to concur in any financial system not violative of the Constitution, and proposed a plan requiring the consent of the states to the establishment of branch banks; vetoed the bill substituted by Clay expressly striking out this requirement; vetoed a second bill called the Fiscal Corporation Bill, which claimed for Congress a similar power to establish corporations in the states; was abandoned by the members of his Cabinet, except Webster; filled their places with States-rights Whigs who were opposed to the kind of bank demanded by Clay; negotiated through Webster the Ashburton Treaty, fixing the NE. boundary for 2,000 m., August 9, 1842; after two vetoes, obtained the enactment of the tariff of 1842; asserted the independence of the Hawaiian Islands, and caused, through Caleb Cushing, the first treaty to be negotiated with China; for four years conducted the whole financial operations of the Union, Congress having repealed all laws providing for the public funds and refused to adopt the so-called "exchequer system" which he proposed; suppressed Dorr's rebellion and ended the war with the Florida Indians; concluded, through Upshur and Calhoun, a treaty for the annexation of Texas (April 12, 1844), and when this was rejected by the Senate effected his object by the passage of the joint resolutions of March 1, 1845; was nominated for the Presidency by the States-rights Whigs, but withdrew from the canvass after forcing the Democratic convention to nominate James K. Polk; was succeeded March 4, 1845, by Polk, and lived in retirement until January, 1861, when he presided over the peace convention of delegates from the "border states," which he suggested as a means to preserve the Union; voted for secession in the Virginia State Convention; elected to the Provisional Congress of the Confederate States, and in November, 1861, to the House of Representatives of the Confederate States.

Tyler, Wat, d. 1381; English rebel who, with Jack Straw, demanded of Richard II that serfdom and outlawry be abolished. He was killed at Smithfield by Walworth, Mayor of London.

Tympanum (tĭm'pănŭm). See EAR.

Tyndale (tĭn'dāl), **William,** abt. 1484–1536; English reformer; educated at Oxford and Cambridge and took orders. He sympathized with the Reformation, excited suspicion by his boldness of speech, and was compelled to flee. He went to Hamburg, where for a year he gave himself to his translation of the New Testament; thence to Cologne, where the first ten sheets were put to press; this was the first printed copy in English; thence to Worms, where in 1525 two editions were published anonymously. There was a great demand for it, notwithstanding the opposition of the clergy. In 1530 appeared his translation of the Pentateuch. After several plots at the instance of the English Govt., he was arrested at Antwerp, and, after eighteen months' imprisonment at Vilvorde, during which he continued his translation, he was there strangled and then burned at the stake. He met his fate with composure. His translation of the New Testament was the principal model and basis of the King James version, and is executed with accuracy and elegance. He also wrote "Obedience of a Christian Man," translated Erasmus's "Soldiers' Manual," and published numerous notes and treatises on the Bible.

Tyn'dall, John, 1820–93; English physicist; b. Leighlin Bridge, near Carlow, Ireland. In 1839 he became connected with the ordnance survey, and was then a railway engineer, when he became teacher of physics at Queenwood College, Hampshire. In 1848 he went to Germany and attended Bunsen's lectures at Marburg. He made discoveries in magnetism which led to his being elected in 1852 a Fellow of the Royal Society. In 1853 he was elected Prof. of Natural Philosophy at the Royal Institution. In 1856, with Prof. Huxley, he visited Switzerland, where he was the first to climb the Weisshorn, and made important observations on the structure and motion of glaciers. The results of this and later Swiss experiences he published in "Glaciers of the Alps," "Mountaineering in 1861," and "Hours of Exercise in the Alps." In 1859 he began his investigations on radiant heat, the results of which he described in "Heat Considered as a Mode of Motion" (1863) and "On Radiation." Later he studied the acoustic properties of the atmosphere and spontaneous generation, discovering a precise method of determining the absence or presence of dust in the air, and lectured on "Dust and Disease."

In 1872 he visited the U. S. on a successful lecturing tour, the profits of which he gave as a fund "in aid of students who devote themselves to original research." In 1874 he was president of the British Association at Belfast, when his address excited a keen controversy as the first clear and unmistakable utterance as to the aims of modern science, and its apparent assertion of materialistic opinions, as in the statement that he found in matter "the promise and potency of every form and quality of life." Toward the close of his life he took a somewhat prominent part in opposing Gladstone's scheme of home rule for Ireland. Died from an overdose of chloral accidentally administered by his wife. Tyndall's eminence did not arise especially from his scientific discoveries, but rather from his force of character, his uncompromising love of truth, his unrivaled grasp of his materials, and his power as a brilliant and effective exponent of physical science, both in his public lectures and in his writings, which are remarkable for their literary merit.

Tyne (tīn), river of N. England; formed by the junction of the N. and S. Tyne. It flows E. and enters the North Sea after a course of 30 m. through the richest mining districts of England. Its chief tributaries are the Derwent and the Team. It is navigable 18 m. from the North Sea.

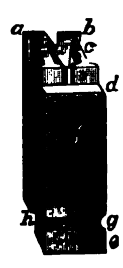


FIG. 1.—TYPE.

Type and **Type'setting.** Type are the letters or characters used in typography. A type is a thin metallic bar, like Fig. 1, which represents the letter M, and has the following characteristics: *c* is the face; *f*, the body; *g*, the nick; *a* to *b*, the width or set; *b* to *d* the height of the printed character; *c* to *e*. the height to paper; *d*, the shoulder; from *d* to the face is called the beard; *h*, the groove left in dressing by cutting off the superfluous metal left by the mold, which leaves two parts for the bottom of the type, called the feet; the thicker stroke of a letter is called the stem or body mark; the fine lines at the top and the bottom of a letter are the serifs; a projection over the body, as the top and the bottom of f, is a kern. Types are made of type metal, a composition of which the principal ingredient is lead. The type founders of the present day use alloys which are generally trade secrets. The alloy most approved is composed of certain proportions of lead, antimony, tin, and copper, so that the metal shall be hard, yet not brittle; ductile, yet tough; flowing freely, yet hardening quickly. Type is made more durable by a process which deposits a thin film of copper over the face. The large letters used in handbills and posters are made of wood.

The names given to the various sizes of type are arbitrary and unmeaning. The following are the old names of the sizes most used in books and newspapers: (1) Brilliant, (2) diamond, (3) pearl, (4) agate or ruby, (5) nonpareil, (6) minion, (7) brevier, (8) bourgeois, (9) long primer, (10) small pica, (11) pica, (12) English, (13) great primer.

The following is a specimen of the sizes of type up to great primer, the numbers corresponding to the numbers and names above:

1.—abcdefghijklmnopqrstuvwxyz
2.—abcdefghijklmnopqrstuvwxyz
3.—abcdefghijklmnopqrstuvwxyz
4.—abcdefghijklmnopqrstuvwxyz
5.—abcdefghijklmnopqrstuvwxyz
6.—abcdefghijklmnopqrstuvwxyz
7.—abcdefghijklmnopqrstuvwxyz
8.—abcdefghijklmnopqrstuvwxyz
9.—abcdefghijklmnopqrstuvwxyz
10.—abcdefghijklmnopqrstuvwxyz
11.—abcdefghijklmnopqrstuvwxyz
12.—abcdefghijklmnopqrstuvwxy
13.—abcdefghijklmnopqrst

The names here given to types are those of the old system, which is falling into disuse in Europe and America. The "point system" is now in use, as shown in the table:

NEW NAME.	Fraction of an Inch.	Old Name.
3-point	0.0415	Excelsior.
3½ "	0.0484	
4 "	0.0553	Brilliant.
4½ "	0.0622	Diamond.
5 "	0.0692	Pearl.
5½ "	0.0761	Agate.
6 "	0.083	Nonpareil.
7 "	0.0968	Minion.
8 "	0.1107	Brevier.
9 "	0.1245	Bourgeois.
10 "	0.1383	Long primer.
11 "	0.1522	Small pica.
12 "	0.166	Pica.

The height to paper, or the distance from the face to the feet of type, varies in the type made by the foundries of Europe and America. The standard English height is .9166 in.; the U. S. new standard is .9186 in.; the French standard is higher. A complete assortment of type of any one face or size is called a *font* or *fount*, which may be varied to any extent. Type founders have a scheme for the proportional quantity of every letter required for a font, and a peculiar scale is necessary for every language. Fonts of book type vary from 50 lb. to 20,000 lb. The type when received from the founder are arranged in a case containing boxes of various sizes for the different characters. The lower case has remained nearly the same as it was two hundred years ago. It is a tray of wood, about 1¼ in. deep, 32½ in. long, and 16⅝ in. wide. Cases go in pairs, the upper case (Fig. 2) containing ninety-eight boxes for capitals, etc., and the lower case (Fig. 3) containing fifty-four boxes for small letters, figures, and spaces. Fig. 2 shows the case adopted by the book compositors of the U. S., having the capitals on the left side and the small capitals on the right. These cases are placed on a frame or stand about the height of the breast, and in a sloping position from the top to the bottom of the case, the capital case on the upper part of the frame, whence called upper case, and the case containing the small letters on the lower part of the frame, hence called lower case.

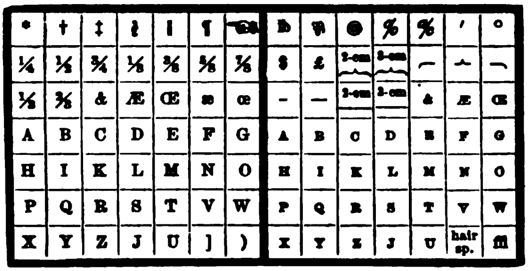

* † ‡ § ‖ ¶ ☞ ℔ ℞ ⊕ % ‰ ′ °
¼ ½ ¾ ⅛ ⅜ ⅝ ⅞ $ £ 2-em 3-em
⅓ ⅔ & Æ Œ æ œ - — 2-em 3-em & Æ Œ
A B C D E F G A B C D E F G
H I K L M N O H I K L M N O
P Q R S T V W P Q R S T V W
X Y Z J U]) X Y Z J U hair sp. ffl

Fig. 2.—Upper Case.

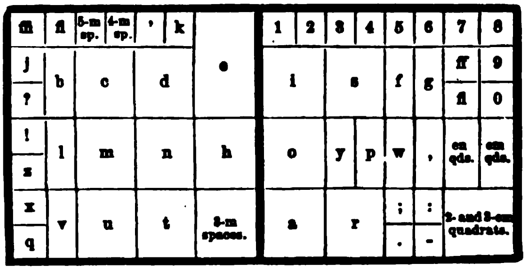

ffi fl 5-m sp. 4-m sp. ' k 1 2 3 4 5 6 7 8
j ? b c d e i s f g ff 9 fi 0
! z l m n h o y p w , en qds. em qds.
x q v u t 3-m spaces. a r ; : . - 2- and 3-em quadrats.

Fig. 3.—Lower Case.

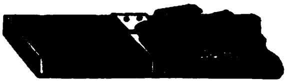


Fig. 4.—Composing-stick.

The compositor in setting up type uses a small frame of steel, having three sides and a bottom, called the composing-stick (Fig. 4). Two sides are immovable, the third side being movable to be adjusted to the width of the page, and then clasped or secured with a screw. A setting-rule, type high, and of the required measure, is also used with the stick; it is made of a strip of steel or brass, having a short-pointed projection at the top of the right end or on both ends. It enables the type to be put quickly in its place, and is used in emptying matter from the stick, in lifting matter, and to support matter in the left hand while distributing with the right. As nearly as the letters will allow in print, the type are set in the stick thus: ꓕʎdoƃɹɐdɥʎ· The stickful is placed on a galley, or oblong tray of wood or brass having a raised edge of half an inch on two, three, or four sides, but generally on the left side and top. Having completed his portion, the matter, as it is now called, is ready to be made up into pages.

Typefounding, the process of casting or making type. In devising a new style of type the first process is to make a model in steel for each letter. Instead of cutting out the interior of the letter, a tool, called the counter punch, is cut on steel to form the hollow or counter of the letter. The counter punch, after hardening, is then impressed in the end of a short bar of soft steel, which is known as the punch. Around this sunken counter the model letter is cut in high relief. The punch is hardened (then resembling Fig. 5), and is punched into a flat piece of cold-rolled copper like Fig. 6, which, after careful finishing, becomes the matrix, or mother-type. The letters at the bottom of the matrix indicate the size, "double English," and the number of nicks—in this case one nick. Every letter requires a separate punch and matrix. The matrix is then fitted to the mold that forms the body of the letter. The hand mold, used until recently, is composed of two parts, which fit exactly together. The external surface is of wood, the interior of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter. The caster, holding the mold in the left hand, with a small ladle containing about a spoonful pours the metal into the orifice, then jerks up the mold higher than his head to expel air and condense the metal, lowers it, opens the mold, and casts out the type. The hand mold is now seldom used, except to cast large metal type.

Fig. 5.—Punch.

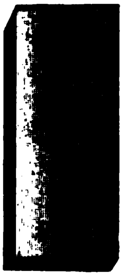


Fig. 6.—Matrix.

Types can be cast by machines quicker than they can be cooled. The hand caster could make 400 in an hour; the Bruce machine, on ordinary book type, turns out 100 in a minute, while the newer machines make 140 or more in a minute.

Type Met'al, an alloy of antimony 2 parts, lead 8 to 11, and some copper and tin. It is hard, yet not brittle, and ductile, yet tough.

Type'setting Machines'. Much of the typesetting of the present day is done on typesetting machines. The simplest form merely sets the types provided by founders; it does not make or distribute the types. One type of machine may be described as follows: For each character a separate case or narrow channel of brass, about 2 ft. long, is provided, in which the types are put side by side and in a nearly vertical position before the operator. The lower end of each case is connected with a lever that is moved whenever the operator touches its mated connection on the lettered keyboard. The lever so touched thrusts out the type desired into the general collecting channel. Another operator, called the justifier, takes the types in the channel and makes them up in lines of uniform length. All the machine can do is to set types in a continuous line, which it does usually four or five times quicker than they can be set by hand. Spacing out or justifying, making up, and distribution must be done by hand, or upon machines of another kind. Each character has cut upon its shank a distinct nick or groove, which permits its entrance only in its own channel during the operation of distribution.

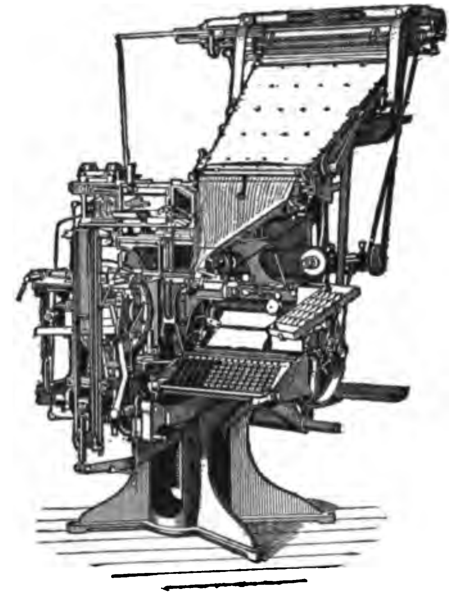


FIG. 1.—LINOTYPE MACHINE.

The machines setting foundry-made type have been practically superseded by machines which both cast and set the type. The Mergenthaler or linotype machine casts the letters selected by the operator, properly justified with spaces between words, in solid bars of the length of line required. Brass matrices operated from a keyboard are dislodged by the operator instead of types, and these are automatically arranged over the mold that forms the line. When the line is full, another automatic device thrusts wedges between the words and spaces out the line. At the same instant a jet of fluid metal is injected and thrown out of the mold as soon as it is cool enough, without delaying the work of the operator. The brass matrices are automatically returned to their proper receptacles for reuse. The Lanston or monotype machine also casts the types it uses, not in lines, but in single characters similar to ordinary foundry type. By the operation of a keyboard, a strip of paper is perforated with holes. This strip of paper is then fed into a casting machine, in which the passage of compressed air through the perforations sets in motion the machine which casts and sets the type.

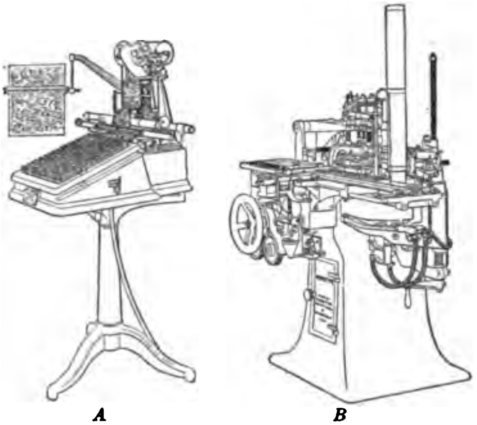


FIG. 2.—MONOTYPE MACHINE. *A*, keyboard; *B*, casting machine.

Type'writers, machines carrying types with which writing is done resembling ordinary print. Since about 1870 they have been brought from a state of crudity to a perfection which compares favorably with any other mechanical device. They are now indispensable in the U. S., and their use is rapidly increasing.

The first recorded attempt to produce a writing machine is that of Henry Mill, an English engineer, to whom, January 7, 1714, was granted a patent for "an artificial machine or motive for impressing or transcribing of letters, singularly or progressively, one after another in writing, whereby all writings whatsoever may be engrossed on paper or parchment so neat and exact as not to be distinguished from print." This machine, however, was not perfected, and no description of it exists. The first typewriter invented in the U. S. was termed the "Typographer," patented in 1829 by William Austin Burt, of Detroit, Mich., also inventor of the solar compass. In design and construction it was an exceedingly crude device, although it would perform writing slowly.

The first practical writing machine was the invention of three men, residents of Milwaukee, Wis., working in conjunction—C. Latham Sholes, Samuel W. Soule, and Carlos Glidden. The first crude model, completed in September, 1867, was a success in that it wrote accurately and with fair rapidity. Many letters were written with it and sent to friends, among others to James Densmore, of Meadville, Pa., who had sufficient enthusiasm to purchase an interest in the machine, without even seeing it, by the payment of all the expenses already incurred. About this time both Soule and Glidden dropped out, leaving the enterprise in the hands of Sholes and Densmore. The first patent upon the new machine was granted in June, 1868. It describes a machine with a circle of type bars striking upward to a common printing point. The keys resembled those of a piano, and moved the type bars by means of cams or arms on the inner ends of the key levers. The paper was held horizontally in a square sliding frame or carriage moving across the top of the machine and provided with motions for line and letter spacing. An arm extending from the rear of the main frame supported a small platen at the common center. An inked ribbon passed across this platen from spools situated on either side of it. The action of the type, therefore, served to carry the paper against the inked ribbon, so that the impression was upon the side of the paper opposite to the type. The motive power for the carriage motion was provided by a falling weight unwinding a cord from a drum at the side of the machine. Densmore made a contract with E. Remington & Sons, gun manufacturers at Ilion, N. Y., and the improved machine has been called the Remington Typewriter ever since.

The first machine wrote only capitals, but this defect was overcome by putting two types at the end of each bar and bringing the carriage bearing the paper to a new printing point by means of a shifting device. Machines of the Remington type are called bar or basket machines, as each type is at the end of a bar and the bars are arranged round the central printing point like the sides of a basket. A different principle was, however, adopted in the Hammond typewriter, which is a cylinder or type-wheel machine. The types are arranged all on one plate, which is moved so as to bring the desired letter to the printing point, when the impression is made by a hammer blow on the paper. Great improvements have been made in the details and arrangements of recent machines, among the more interesting of which is the visible writing feature and the device for automatically spacing columns of figures or other tabular matter. Copying ink is generally used in typewriter ribbons and pads, so that reprints may be made by the copying press. By the use of carbon paper, interleaved with sheets of thin typewriter paper, several copies may be made at once. By removing the ribbon it is possible to make on the typewriter the waxed stencils used on the mimeograph. Among the foremost of the adaptations of the typewriter to special purposes may be mentioned the book typewriter, by which the typewriting can be done on the pages of a bound book, a method which is displacing the copying by hand of official and legal records. On the so-called electric typewriters the lightest touch on one of the keys brings into play an electric motive force which causes the type to compress the paper and shifts the carriage without effort on the part of the operator.

According to the census of 1905, the typewriter industry of the U. S. included sixty-six establishments, with a value of their products at $10,640,495.

Ty'pha. See CAT-TAILS.

Typhoid (tī'foid) **Fev'er,** called also TYPHUS ABDOMINALIS and ENTERIC FEVER, an acute infectious fever which has a duration of about four weeks, and is characterized by continuous high fever, abdominal distention, diarrhea, a rash on the skin, and great depression, and is due to the action of the typhoid bacillus in the intestines.

Typhoid fever occurs in all parts of the world and affects all kinds of people. It generally attacks young persons, from fifteen to thirty. Spring and autumn are the seasons of its greatest prevalence. In most large communities it is endemic—that is, isolated cases are constantly present—but under certain conditions local or widespread epidemics are met with. The infection in most, if not all, cases enters the system with drinking water, milk, or other food, directly or remotely contaminated by the intestinal discharges of persons ill with the disease. Exceptionally the virus may be directly conveyed to the mouth by unclean hands, or it may become dried and reach the nose or mouth through the air, eventually finding its way into the intestines. The morbid changes in the body in typhoid fever are principally found in the lower part of the small intestines, where the Peyer's glands undergo swelling and, finally, deep ulceration. The spleen and the lymphatic glands become enlarged, and the other organs of the body may suffer changes in consequence of continued fever.

The disease begins gradually. At first the patient suffers with headache, backache, and lassitude; frequently the nose bleeds, and sometimes colic and a little looseness exists, though as a rule there is constipation. Gradually, day by day, the temperature rises, reaching 103° or 104° F. in five or seven days. After this the fever remains elevated to about the same point, falling in the morning and rising again toward evening. The characteristic symptoms of the disease are noted in the second week of the disease and after that time. These are the regular fever, the great lassitude, abdominal distention with tenderness over the seat of the ulcers and diarrhea. In many cases, especially when the fever is decided, muttering or delirium, twitching of the muscles, and great prostration supervene. Stupor, and even complete coma, may occur. After about two weeks these symptoms abate, the fever descends, and a slow convalescence is established. About the seventh to the ninth day a rash is noted in the skin of the abdomen, consisting of small red spots, which appear in separate crops, and last but a few days, when they fade from view. Many variations are encountered. Sometimes there is scarcely any fever or other signs of illness, and the case is spoken of as walking typhoid; again, but rarely, the symptoms may be so intense that the case assumes a malignant character. Death may occur from perforation of the intestines or hemorrhage from deep ulceration; from slow exhaustion; or from various complications, as pneumonia, peritonitis, or the like.

The mortality in typhoid fever varies greatly in different epidemics and at different periods of the same epidemic. Modern methods of treatment have lowered the death rate very materially. First and foremost in treatment is proper nursing. The patient must be confined to bed from the very first possible moment, and he must be given a diet of milk, eggs beaten in milk or broths.

The direct treatment of the disease is mainly concerned with the control of the fever. It is probable that no remedy materially alters the course of this disease. The control of fever by cold water, however, has in practice reduced the mortality from 15 or 20 per cent to 1 or 6 per cent. Drugs to reduce the fever are to be avoided on account of their depressive action. Remedies may be needed to control diarrhea, to aid digestion, to relieve nervous excitement, and to combat untoward symptoms of other kinds. During convalescence the utmost care should be exercised to prevent intestinal irritation by a too early return to the use of solid food. Tonics may be needed. Frequently the patient's health is much better after than before an attack, but this is not always the case. Not rarely relapses occur immediately after the attack; but once the patient has completely recovered there is nearly always immunity from subsequent seizures. Now and then, however, instances are met with of second or even third attacks.

Ty'phon. See Set Typhon.

Typhoon (tī-fōn'), a tropical cyclone, especially that of the China Sea. The storms first come in view in the S. part of this sea, and take a NE. course, destroying shipping and doing great damage on shore in the Philippines, Formosa, and even so far N. as Japan, and they are sometimes encountered far out on the Pacific on the latitudes of Japan. They occur in late summer and in autumn, and are like the hurricanes of the W. Indies and N. Atlantic. The name typhoon is also frequently applied to similar great, intense storms of tropical origin in the S. hemisphere—about Samoa and the Fiji Islands and in the Indian Ocean about the Mascarenes. See Hurricanes.

Ty'phus Fev'er, an intensely contagious disease, which is characterized by high fever, lasting ten days to two weeks, by a rash, and by great prostration. It occurs where squalor, destitution, and overcrowding abound, and has been variously called ship fever, jail fever, camp fever, and the like. In former centuries it was a common scourge, but is now almost limited to half-civilized countries and to the slums of great seaports. Local outbreaks are met with from time to time on ships, in jails, or other places of like character. The specific cause has not been discovered, though it is very probably a microörganism. The onset is abrupt. After a brief period of preliminary indisposition, or without such, the patient falls into a chill or convulsion, or is seized with vomiting; fever develops rapidly and rises to a high point, and the patient has violent pains in the head, back, and limbs. The pains and fever continue, strength is rapidly lost, and soon the patient sinks into stupor or delirium. The tongue is dry and coated; the breath is heavy and offensive; the skin dry and excessively hot, often pungent; the eyes are bloodshot. On the third to the fifth day an eruption of spots of dark red "mulberry" color appears in the skin and persist for some days, fading gradually. If the patient survives, about the tenth to the fourteenth day a sudden fall of the fever is likely to occur. So sudden is this crisis and so immediate the improvement in many cases as to recall the scriptural passage: "On such a day the fever left him and he was well." The mortality in typhus fever is sometimes extremely high, most cases dying of exhaustion, of high fever, or of complications, such as pneumonia. The treatment simply consists in the control of the fever and in stimulation. Pain may require sedatives.

Typeg'raphy. See Printing.

Tyr (tīr), in Scandinavian mythology, a son of Odin. He is the bold god of war, and heroes pray to him for victory. The third day of the week is called after him, Icelandic *Tyrsdagr, Tysdagr*; Danish *Tirsdag*, English *Tuesday.*

Tyran'nidæ. See Kingbird; Flycatcher.

Ty'rant, a term which, in ancient Greece, did not necessarily designate, as at present, a despotic and cruel ruler. The Greek tyrants were powerful citizens who by force or stratagem assumed the rulership of a state or city without lawful warrant. Sometimes, in seasons of political disturbance, the government of a *tyrannus* was highly beneficial, commercially and socially. Some of the tyrants were men of wisdom and beneficence. But the natural tendency of such an unlawful exercise of power is toward oppression and injustice.

Tyre (tīr), ancient city in Phœnicia, on the Mediterranean; 20 m. from Sidon. It was the wealthiest and most magnificent of the Phœnician cities and sent out many colonies, of which Carthage was the most important. Hiram, King of Tyre, was the ally and friend of Solomon. It was besieged five years by Shalmaneser and thirteen years by Nebuchadnezzar. Alexander captured it after a siege of seven months (332 B.C.), when the garrison were put to death and 30,000 Tyrians sold as slaves. It was taken by the Saracens (636), by the crusaders (1144), by the Sultan of Egypt (1291), it being first abandoned by its inhabitants, and by Selim I (1516). The foundation of Alexandria (332 B.C.) was a great injury to Tyre, and the discovery, almost 2,000 years later, of a passage to India by the Cape of Good Hope dealt the finishing blow to its prosperity. Ancient Tyre consisted of two parts—Palæo-Tyre on the mainland and Neo-Tyre on an island. The narrow sound between formed the harbor. The mole constructed by Alexander has through deposits become an isthmus, and the former island is now a peninsula whereon the miserable village of Sour is situated. Numerous ancient remains jut through the soil, and foundations are seen among the waves (Ezek. xxvi, 5). Sour now exports only cotton, tobacco, charcoal, and millstones. Pop. abt. 6,000.

Tyrian (tĭr'ĭ-ăn) **Pur'ple,** a celebrated dye used by the ancients, and prepared extensively at Tyre from the shellfish Murex (*q.v.*), from each of which only a minute quantity was obtained at enormous cost; hence this color became the symbol of imperial power. Purple is now obtained from vegetable and mineral sources.

Tyrol, or **Tirol** (tĭr'ŏl), and **Vorarlberg** (fŏr-ărl'bĕrkh), province of the Austrian Empire, the ancient Rhætia; bounded N. by Bavaria, W. by Switzerland, and S. by Italy. Area, 11,324 sq. m. The country is mountainous throughout, traversed from W. to E. by three lofty chains of the Alps—the Tyrolese Alps in the N., the Trentine Alps in the S., and in the middle the Rhætian Alps, the highest of the three ranges, Mt. Ortler rising 12,812 ft. and Gross-Glockner 12,457 ft. The valley between the Tyrolese and Rhætian Alps is drained by the Inn, which flows through Bavaria to the Danube; the valley between the Rhætian and Trentine Alps is drained partly by the Adige, an affluent of the Po and partly by the Drave, which flows through Carinthia to the Danube. Much of the surface is covered with perpetual snow and glaciers. Nearly 40 per cent is covered with forests, and most of the remainder is pasture. The scenery is magnificent. Only a small part is suitable for tillage, but that part is carefully cultivated. Wheat, rye, oats, and barley are grown, though not enough for home consumption; in the gardens, vineyards, and orchards in the S. valleys excellent wines, mulberry trees for the rearing of silkworms, and fine fruits, olives, and figs are raised. The chief industry is the rearing of cattle, especially sheep and goats, which in the summertime are pastured just below the snow line. Salt and iron are produced, and various manufactures are pursued, mostly on a small scale. The climate is severe in the N. and W., but is mild and almost like that of Italy in the S. Canary and other singing birds are raised and exported. Pop. (1900) 981,949, of whom nearly 60 per cent speak German, the rest Italian or some Romance or Slavonic dialect. Capital, Innsbruck. Of the combined province, Vorarlberg occupies the NW. corner, and has an area of only 1,007 sq. m.; pop. (1900) 131,887. Each element of the province has its own local government. The country was originally inhabited by the Rhæti. It was conquered by Drusus and Tiberius, and became thoroughly Romanized, but in 600 it was largely peopled by the Baiuvarii, a Teutonic tribe. In the thirteenth century a part of the province came into the hands of the Counts of Tirol, a district near Meran, but it became chiefly consolidated under the Counts of Meran and their descendants. On the failure of the male line the province was made over to the house of Hapsburg, to which it has since belonged, except during the period 1805–14, when it was in the possession of Bavaria. The inhabitants vigorously resisted the latter power, and were for a time successful in a revolt under the leadership of Hofer in 1809.

Tyrrhenian (tĭ-rē'nĭ-ăn) **Sea,** the ancient Mare Tyrrhenum; that part of the Mediterranean which lies between the Italian mainland and the islands of Sardinia, Corsica, and Sicily.

Tyrtæus (tẽr-tē'ŭs), Greek poet of the seventh century B.C., a Spartan by birth or adoption. He composed marching songs, to be sung with the music of the flute, and exhortations to constancy and courage. It is said that their inspiring effect made the Spartans victorious in the second Messenian War. Fragments remain.

U

U, the twenty-first letter of the English alphabet. The form U is derived through the Roman V from the Greek upsilon, V, a variant form of Y. The letter stands regularly for the sounds (1) *yu* (*yoo*), as in *mule, usage, value*; (2) *oo*, as in *rule, rude, rural*; (3) *ŏŏ*, as in *bull, pull, put*; (4) *ė*, as in *murmur, urn, fur*; (5) *ŭ* (unrounded), as in *tub, bud, under*. It also has the sound of *ĭ* in *busy, lettuce, minute*, and has the consonant value of *w* between *q* or *g* and a vowel, as in *quality, language*. It is silent, *e.g.*, in *biscuit, circuit, rogue, guess, build*. See ABBREVIATIONS.

Uffizi (ŏf-fēt'sē). See FLORENCE.

Uganda (ū-găn'dă), long famous as the most powerful native kingdom of the lake region of central Africa; lying on the N. and W. sides of Victoria Nyanza. Bordered on the E. by the Nile, its N. limit is, approximately, in the same latitude as Lake Gita. W. of Victoria Nyanza, it includes about half the territory between that lake and Lake Albert Edward, being limited on the S. by the Kagera River; also the Sesse archipelago and other islands in Victoria Nyanza. It consists of undulating uplands, in part well timbered, and so high above the sea that the climate is fairly salubrious, though under the equator. The soil is fertile, and the plantations are devoted chiefly to the banana, plantain, maize, and yam, which form the main food supplies, though beef, goats' flesh, and fish are also eaten. Chief products: ivory, skins, rubber, and chillies. One family has reigned in Uganda for over three hundred years, and the king, though shorn of his authority by the British, who are now in possession, is still regarded with superstitious reverence by the peasantry.

The people belong to the Bantu family, and are much higher in intellectual development and civilization than any other central or E. Africans. They are fully clad, are skilled in brass, iron, and copper working, and were a prosperous and numerous people when discovered by Speke (1862), and described by Stanley (1875). For years after 1884 the country was exhausted by civil wars and by the attempt of the king, Mwanga, to extirpate Christianity by massacres. Christianity, however, has taken a firm hold upon the country, which is divided into three political and religious parties, the Mohammedans, Catholics, and Protestants. Peace is fairly well maintained only by means of a native military force in the service of Great Britain. Pop. (1907) 4,000,000. British capital, Entebbe; native capital, Mengo, near which a Protestant cathedral was built in 1904. The Uganda Railway from Mombasa, on the Indian Ocean, to Kisumu, on Victoria Nyanza, is now within the E. African Protectorate. The country is of great strategical importance, as it dominates Lake Victoria and controls the head waters of the Nile.

Uhland (ō'länt), **Johann Ludwig**, 1787-1862; German poet and scholar; b. Tübingen; studied law, and practiced in Stuttgart, 1812-30; elected to the Würtemberg Assembly, 1819; Prof. of German Language and Literature, Tübingen, 1830, but resigned, 1833; member of the National Assembly of Frankfort-on-the-Main, 1848; retired to private life. Among the great lyric poets of Germany in the nineteenth century Uhland takes a foremost place. At the beginning of his poetic career he was deeply influenced by the romantic school, but kept free from its fantastic extravagances. While the latter looked upon the Middle Ages with a vague enthusiasm and an undue overestimation, Uhland's love for mediæval German life and poetry resulted from an intimate knowledge based upon thorough studies. Most of his lyric poetry can be compared only with Goethe's songs and the best of the Volkslied, and so perfectly did he know how to reproduce the spirit of the latter that many of his poems became folk songs.

As a writer of ballads he has few equals in German literature. But his dramas, "Herzog Ernst" and "Ludwig der Bayer," though highly poetical in passages, are lacking the true dramatic effect. During the latter part of his life Uhland devoted himself exclusively to scientific research in the fields of literature and mythology, and the results of his investigations are collected in the "Schriften zur Geschichte der Dichtung und Sage," published after his death. Equally great as a poet and scholar, Uhland also played a conspicuous and noble part in politics, and his activity in the latter field shows the same devotion, simplicity, and manliness which characterize his entire career.

Uin'ta, or Uintah, Moun'tains, a range of mountains in Utah in the N. part of Wasatch and Uinta cos., extending E. and W. and joining the Wasatch range on the W., consisting largely of rocks of the Carboniferous age. Gilbert Peak is 13,687 ft. high.

Uitlanders (oit'lănd-ėrs), literally "outlanders or foreigners," name given by the Boers to those whites who had lived in their country since the discovery of gold in 1886. The conduct of the Boers with respect to the Uitlanders led to the last Boer War and the extinction of the Boer republics.

Ujiji (ō-jē'jē), a place in Africa, consisting of a number of mud huts, and situated on the shore of Lake Tanganyika, in a district of the same name, in lat. 4° 58′ S., lon. 30° 4′ E. It became noted as the point where Stanley met Livingstone on November 10, 1871.

Ul'cer, a localized disintegration on one of the external or internal surfaces. Two processes are concerned in ulceration: the death of cells of the part of the surface involved, and inflammatory conditions at the base and sides. The causes of ulceration are those of inflammation, with an added element of poor reaction on the part of the tissue involved. Local injuries, as by pressure, and foreign bodies, as splinters, are the immediate exciting cause in external ulcers. Internally, as in ulcers of the mouth, stomach, or intestines, the immediate exciting cause is either injury by foreign bodies or by microörganisms and decomposed secretions or other contents. To make the exciting causes operative to the production of an ulcer, diminution in the resisting power of the tissues is necessary. This explains the occurrence of ulcers on the lower extremities in old people when the veins are varicosed and the circulation sluggish; in anemic or debilitated subjects, in parts of the body exposed to constant wetting, and in tissues where the nerve tone is lowered, as in paralyzed parts.

The appearance of ulcers varies greatly. In general there is an irregular excavation, with a base covered with pus and showing small red elevations, the inflammatory granulations by which nature repairs the injury. According to the variations from this general appearance and from the greater or less tendency to heal there are described: *Indolent ulcers*, in which the base and edges are hard and healing is very slow; they are common on the legs of old people; *irritable ulcers*, which are painful and bleed easily; *inflamed ulcers*, in which from irritation active inflammation is evident; *sloughing ulcers*; *phagedemic ulcers*, in which great tissue destruction occurs. There are certain parts of the body specially liable to ulcer formation. Such are the lower part of the legs, the mouth, the stomach, the intestines (especially in typhoid fever and in tuberculosis), and the rectum. The tendency of ulcers is to get well spontaneously. Nature is best assisted by cleanliness of the part, local or general tonic remedies to build up the reparative power, and stimulating applications to the ulcer, strapping, or incision when there is a tendency to indolence.

Ulm (ōlm), city of Würtemberg, Germany; at the influx of the Blau into the Danube, which here becomes navigable. It is 58 m. SE. of Stuttgart, is fortified, and is a place of much interest to the tourist, on account of its many fine old buildings. Its cathedral (Protestant), begun in 1377 and carried on till 1494, then left unfinished till 1844, was completed in 1890. It is a magnificent Gothic edifice, and contains the largest organ in Germany. The open-work spire is the highest in the world (530 ft.). The town has a great variety of manufactures, including brass founding, paper making, brewing, etc., and is famous for its ornamental tobacco pipes. On October 17, 1805, Gen. Mack, at the head of an Austrian army of 30,000 men, here capitulated to Napoleon. Pop. (1905) 51,820.

Ul'na. See Arm.

Ul'ster, the northernmost of the four provinces into which Ireland is divided; borders N. and W. on the Atlantic and E. on the N. Channel and the Irish Sea; area, 8,613 sq. m. The surface is greatly diversified; the W. part is mountainous, some summits being over 2,000 ft. high. The province contains the large loughs Neagh, Strangford, and Erne. Pop. (1901) 1,582,826.

Ultramon'tanism (*ultra,* beyond + *montes,* mountains—*i.e.,* the Alps), in the Roman Catholic Church the principles and tendency of those who desire rather to increase than to minimize the authority and power of the pope. The opposite tendency is known as Gallicanism.

Ultra Vires (ŭl'tră vī'rēz), Latin, "beyond the powers," a term applied to the contract of a corporation when it is beyond the powers conferred upon this artificial person by its charter and the general laws applicable thereto. The term is quite modern, having been introduced by Baron Bramwell as counsel in *East Anglian R. Co.* vs. *Eastern Counties R. Co.,* 11 Common Bench 775, in 1851. It has been applied to authorized acts which the corporation has performed in an unauthorized manner; also to acts within the power of the corporation, but not within the authority of the officers or agents who have done them. Still again it has been applied to positively illegal acts of corporations.

The general rule is that *ultra-vires* contracts are not enforceable. This rests upon three reasons: (1) The interest of the public that the corporation shall not transcend the powers granted; (2) the interest of the stockholders that the capital shall not be subjected to the risk of enterprises not contemplated by the charter, and therefore not authorized by the stockholders in subscribing for the stock; (3) the obligation of everyone, entering into a contract with the corporation, to take notice of the legal limits of its powers.

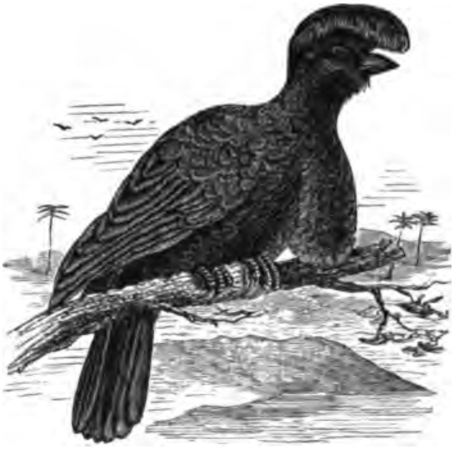
Torts committed by corporations are not within the doctrine of *ultra vires.* To permit the defense of *ultra vires* in such cases would be equivalent to a license to corporations to indulge in unlimited wrongdoing.

Ulysses (ū-lĭs'ēz). See Odysseus.

Umbel'lifers, or **Umbellif'eræ,** a family of 1,400 species of dicotyledonous herbs, or, rarely, shrubs, abounding in both hemispheres, chiefly in cool regions. Most have hollow striated stems, and flowers in umbels, but these are not perfectly constant characters. Among its useful plants are the carrot, parsnip, skirrit, chervil, fennel, caraway, dill, coriander, anise, parsley, and celery. Some are useful in medicine, many being active poisons.

Um'ber, a mineral pigment formerly obtained from Umbria in Italy, but at present chiefly imported from Cyprus. Small quantities are found in the U. S., chiefly in Pennsylvania. Its composition is: Silica, 13 per cent; alumina, 5 per cent; iron oxide, 48 per cent; manganese oxide, 20 per cent; water, 14 per cent. When gently heated, water is expelled, and a dark-brown pigment termed *raw umber* is formed; at a higher temperature it is converted into a soft red-brown modification known as *burnt umber.* The dark colors of these pigments depend upon the manganese. They are extensively used as oil and water-color pigments, and are often mixed with other colors.

Umbrel'la Bird, a name given to certain of the cotingas (*Cotingidæ*) because they bear a large crest which seems to shade the head like an umbrella. The most familiar species has a long feathered wattle hanging from the lower part of the neck. It is nearly the size of a crow, and of a blue-black color. It inhabits the forests of E. S. America.



Umbrella Bird.

Umbria (ŏm'brē-ă), an ancient division of Italy, extending along the E. of the upper Tiber, and embracing the valleys formed by the smaller water courses of the Apennines E. to Adriatic. In classical times the Tiber formed the W. boundary between Umbria and Etruria, while the E. border extended along the Adriatic from the Rubicon to the Æsis. The region contained no important towns, but was inhabited by a population devoted to agriculture and grazing, living in small hamlets. The inhabitants were related in race and language to the Sabine and Latin peoples to the S. and W. The name is now given to Perugia.

Umlaut (ôm'lout), or **Vow'el Muta'tion,** a technical term of Teutonic grammar denoting in its strictest application the influence exercised upon an accented syllable by the vowel *i* in a following syllable. The application of the term has been extended to the influence of other vowels than *i,* so that it is possible to speak of *i*-umlaut, *o*-umlaut, *u*-umlaut; but in its proper and original significance, and when left unqualified the term applies to *i*-umlaut. Thus, in English, Frank became French through the intermediary word Frankish, and such plurals as "men," "mice," "feet," are explained in the same way. In German, Gott, göttlich, mann, männlich are examples of umlaut. See ABLAUT; ACCENT.

Unau (ū-nä′), the two-toed S. American sloth.

Uncas (ŭng′kăs), an Indian sachem; b. in the Pequod settlement, Connecticut; abt. 1600–83. Originally a war chief of the Pequods, he revolted against Sassacus, the sachem, in 1634; made friends with the whites, and became chief of the Mohegans. In 1637 he joined Mason's expedition against the Pequods, and was rewarded with some of their lands; made several treaties with the settlers, and in 1643 joined them in a war against Miantonomoh, the Narragansett sachem. In 1657 he was besieged in his stronghold on Connecticut River by the Narragansetts, but when on the point of starvation was relieved by Ensign Thomas Leffingwell, to whom it is said that he granted the land upon which Norwich now stands, although he later sold it to others. Many complaints were made against him by other Indians, and in 1654 he was warned that he would not be protected in any unlawful or outrageous course. He was always on good terms with the whites.

Un′cial Let′ters, a name used in paleography for the rounder characters which took the place of capitals in the manuscripts of the early Middle Ages. The angular capitals of the inscriptions could not be written with ease and speed on papyrus or parchment. By the fourth century the uncial was fully developed, and till the eighth it was the prevailing hand of books. The letters which especially show the change are a, d, e, h, m (which then took on the forms so familiar in our small letters) and, in less degree, g, q, t, u. The name uncial is borrowed from St. Jerome, who censures the luxury of books written "*uncialibus ut vulgo aiunt litteris,*" though there is every reason to believe that he meant large letters in general. The name uncial, borrowed from Latin paleography, is applied also to the rounded Greek capitals, which, appearing as early as the third century B.C., remained the current book hand till the ninth century A.D.

Uncon′scious Cerebra′tion. See MIND.

Unc′tion, Extreme′. See EXTREME UNCTION.

Un′derground Rail′road, a plan used before the Civil War by which abolitionists helped fugitive slaves to escape, usually through Ohio and Pennsylvania. It was a line of hiding places, in which the fugitives were fed during the day and passed along at night to the next station.

Underground Rail′ways, railway lines built below the level of the streets of a city, partly in tunnels. The underground railways of London were begun in 1860, and in 1884 the inner circle, connecting the principal railway termini on the N. side of the Thames, was completed; this is 13 m. long, with four tracks and twenty-seven stations. The Metropolitan District Railway forms an outer circle, with extensions leading to the suburbs. In these railways the cost of construction was extremely high, owing to the difficulties of tunneling and excavating without disturbing the foundations of buildings; it ranged from $1,800,000 to $2,500,000 per mile. The number of passengers carried on the inner circle is about 90,000,000 per year. The motive power is mainly steam, the exhaust steam and smoke being condensed in water tanks during the passage through the tunnels. The City and South London electric-traction line was opened in 1890.

An underground belt line in Baltimore, 7 m. long, was completed in 1892; it has four tunnels, the principal one being 8,350 ft. in length. This was built to enable the Baltimore & Ohio Railroad to reach the central part of the city. Its cost was about $1,000,000 per mile. Boston has a subway, in part four-track and in part two track, that carries the electric street-car traffic through portions of the heart of the city. It was built in 1897–99 at a cost of $4,400,000. January 15, 1900, the New York Rapid Transit Commission let the contract for an extension of the underground system, and on March 24th the work was formally begun. The subway was opened October 27, 1904. The route extends from the Battery to Van Cortlandt Park, traversing the entire length of Manhattan Island and crossing the Harlem River at Kingsbridge. An E. branch diverges at Ninety-sixth Street and extends NE. as far as Bronx Park. A Brooklyn extension crosses under the East River. A system of tracks connects New York and Hoboken by means of tunnels under the Hudson River. See RAILWAY.

Ungava (ŭng-gä′vȧ), a district of Canada lying between Hudson Bay and Labrador, and occupying the greater part of the Labrador peninsula. Area 354,961 sq. m. Its climate is rigorous and it has been but imperfectly explored. Large lakes and numerous rivers are known to exist, however, as well as extensive forests of valuable pulp wood. The settlements are few and widely scattered. Pop. abt. 5,000.

Ungula′ta, the order of hoofed mammals, including the horse, camel, pig, cattle, elephant, etc. Their toes are surrounded by a thick nail or hoof, on which they walk. There are about 250 living species, and among the extinct forms are some which bridge the present division into ruminants and non-ruminants. The order is noteworthy as furnishing by far the largest portion of the meat food which man uses, as also the beasts of burden which he employs. Almost all the species—and above all the ruminants—are hunted or kept for the meat they yield, and even the horse, rhinoceros, and especially tapir, are esteemed as food by some peoples. Beasts of draught and labor are obtained chiefly from the *Equidæ* (horse and ass, etc.), the *Bovidæ* (ox, buffalo, etc.), and *Cervidæ* (reindeer). Their contributions in other ways are manifold; the most noteworthy are milk, hides, glue, etc. See the names of the different suborders and families, as well as the domesticated animals, and especially the article HORSE.

U'nicorn, described by various writers, from Aristotle and Pliny down, as a white horse-like creature with a straight horn in the middle of the forehead. Its figure is used in heraldry. The word *reem* in the Hebrew Bible, translated "unicorn" in the English version, denotes some horned creature, perhaps the buffalo.

UNICORN.

Uniform'ity of Na'ture, the principle that there are no breaks in the operation of natural law. The principle underlies the statement of all the so-called laws of nature, since the possibility of arguing from one or more observed facts in nature to other facts of the same kind which are not observed must rest upon the presumption that the sequences of events in nature are stable and regular. If a certain combination of chemical elements takes place to-day under certain conditions, the chemist expects the same combination to take place under the same conditions to-morrow. And it does. So, on the basis of this uniformity, he announces the discovery as a fact which any other chemist can confirm. The second application of the principle is made in philosophy. It consists in the demand that uniformity shall be given due criticism, and its meaning in the world as a whole made out. This demand has led to various views—*i.e.*, that uniformity is itself a hypothesis respecting nature, resting upon the experience that nature repeats her events; again, that uniformity is an inborn regulative principle of the human mind. The construing of uniformity, however, has been largely confined to external nature, mind and its events being held to present in free will a phenomenon which violates it. As to the merits of this position, see WILL. The rise of the evolution hypothesis has broken this tradition; the mind is treated as a natural thing and the science of its movements as involving the presuppositions of the natural sciences.

Un'ion, Union Hill, or **Town of Union,** a town of Hudson Co., N. J.; on the Hudson River, opposite New York and 1 m. N. of Hoboken. It has brewing, silk, and other industries. The post office is Weehawken. Pop. (1907) 17,005.

U'nit. See UNITS.

Unita'rianism, in theology, the doctrine that God exists in one person only. This involves the denial of the doctrine of the Trinity and the divinity of Jesus Christ. Unitarianism, without putting forward a formal creed of its own, holds that every man has a perfect right to judge for himself, unbound by any set of articles; that, while professing itself to be a Christian body, it leaves everyone to decide for himself what Christianity itself is—*i.e.*, without forfeiting his place in the body to choose among the conflicting views of Christian doctrine and statement that which seemed to him to be true and right.

Unit'ed I'rishmen, an Irish political society formed to aid Grattan in carrying out his reforms. It was originally a peaceful organization, but about 1795, under the influence of Theobald Wolfe Tone, it became active in fostering rebellion against the British Govt. Tone was captured in 1798, but the rebellion was not put down till 1800, and was followed by the formation of the United Kingdom of Great Britain and Ireland.

United Prov'inces, the seven N. provinces of the Netherlands, united January 23, 1579, at Utrecht, for mutual defense.

United Provinces of La Pla'ta. See LA PLATA, UNITED PROVINCES OF, and ARGENTINE REPUBLIC.

United Soci'ety of Believ'ers. See SHAKERS.

Unit'ed States, a federal republic composed (1910) of states, organized territories, the District of Columbia, and Alaska; capital, Washington, D. C.

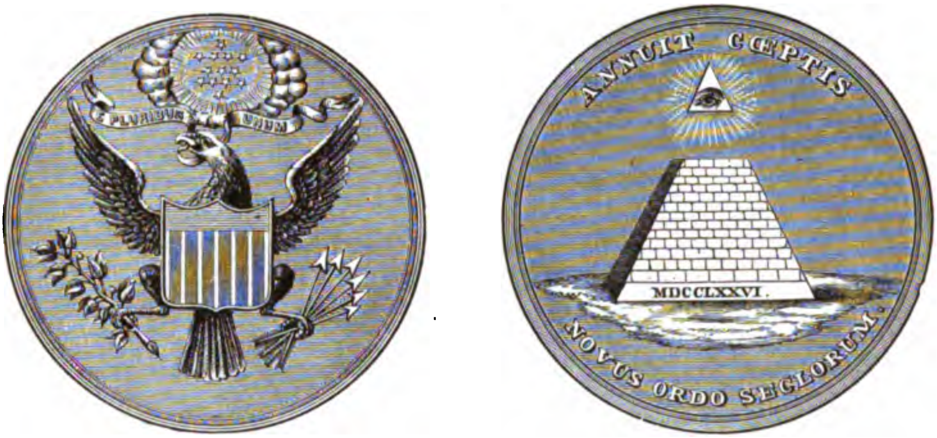
Geographical and Physical.—The country consists of three detached portions: the middle of the N. American continent, embracing all the states and all the organized territories but Hawaii, together with the District of Columbia; the unorganized territory of Alaska, occupying the NW. part of the continent; and the Hawaiian archipelago, now organized as a territory, lying in the Pacific Ocean midway between America and Asia. In addition, there are the dependencies of the U. S., acquired as a result of the Spanish-American War. These are the Philippine Islands, the NE. group of the great archipelago between Australia and Asia; Guam, one of the southernmost and largest of the Ladrone Islands in the Pacific; and Porto Rico, the easternmost and smallest of the Greater Antilles, in the W. Indies. These are not properly an integral part of the U. S., although depending upon the country governmentally. (See GUAM; PHILIPPINE ISLANDS; PORTO RICO.) The shore line of the main part of the country, including bays, islands, etc., is 6,150 m. on the N. Atlantic coast, 6,209 on the S. Atlantic, 5,744 on the Gulf of Mexico, and 3,257 on the Pacific, a total of 21,354 m. Excluding bays, islands, etc., this is reduced to 5,270 m. The total area of all states and territories, including Alaska (590,884) and Hawaii (6,449), is 3,622,933 sq. m. The Philippines, in addition, include 128,000 sq. m.; Porto Rico, 3,688; and Guam, 150, making a total, for the U. S. and all dependencies, of 3,754,771 sq. m.

The main body of the country presents two great systems of uplift—the Appalachian system, near the Atlantic coast, and the Cordilleran, much higher, broader, and more complex, occupying the W. third of the country. The N. part of the Appalachians consists of isolated groups such as the White and the Adirondack Mts. and of ridges such as the Green and the Berkshire Mts. Highest is Mt. Washington, in the White Mts., 6,293 ft. The S. part, of different type, includes an E. range, the Blue Ridge, and a W., the Alleghenies. In N. Carolina these are connected by a somewhat confused group culminating in Mt. Mitchell, the highest Appalachian summit, 6,688 ft.

Between the Appalachian system and the

Cordilleran lies the Mississippi valley, largely, except in the N. part, a flat, fertile region, except for its river bluffs and for the Ozark Hills in Missouri and Arkansas, 2,500 to 3,000 ft. W. of this valley stretch the Great Plains, inclining gradually upward until, at the base of the Rocky Mts., they are 5,000 ft. above the sea. These mountains are the easternmost of the Cordilleran system, and rise in many cases 12,000 to 14,000 ft. above the sea, reaching their greatest height and complexity in Colorado.

The region drained by the Colorado is the most remarkable part of the country, consisting of plateaus cut by cañons—deep, narrow gorges, culminating in the Grand Cañon of the Colorado in N. Arizona, 6,000 ft. deep, and 10 to 12 m. wide at the top.



A B

Great Seal of the United States. A. Obverse; B. Reverse.

W. of the Wasatch Range, a spur of the Rockies in Utah, lies a region deficient in rainfall and intersected with several dry ranges, separated by detritus-filled valleys. This is known as the Great Basin, and contains the celebrated Great Salt Lake. Still farther W. is the Sierra Nevada Range, known as the Cascade Mts. in its N. part, and here volcanic in origin, including the cones of Rainier or Tacoma, 14,444 ft.; Shasta, 14,350 ft.; and Hood, 11,255 ft. The S. range has a long, deeply eroded W. slope. The valley to the W. is the great wheat region of the Pacific coast, and is separated from the ocean by the Coast Range, mostly 3,000 to 4,000 ft., but reaching, as the Olympic Mts. of Washington, a height of 8,000 ft.

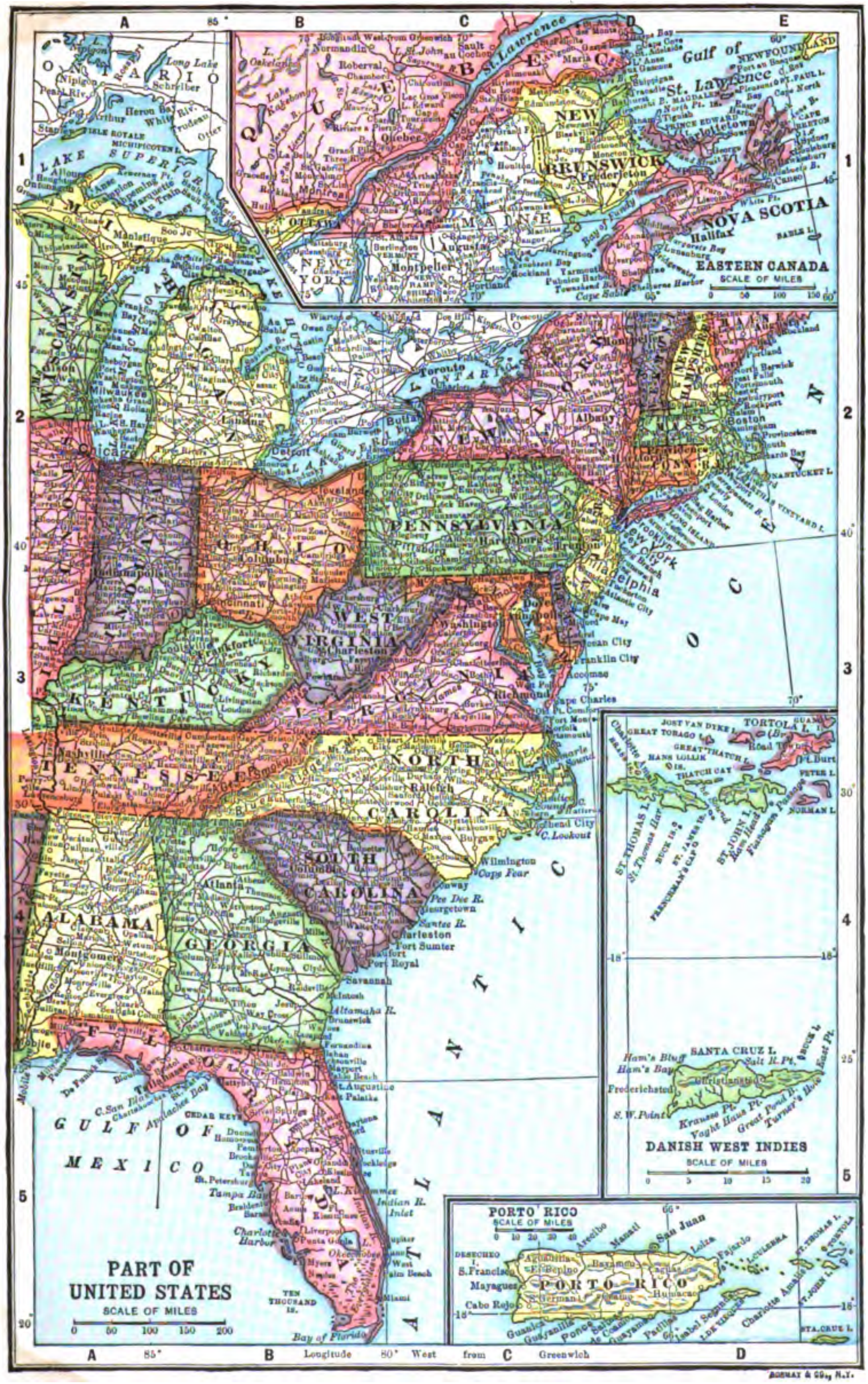
The river systems that drain these various parts of the country may be divided into four groups: the N. lake group, consisting of the great lakes and their tributaries, discharging through the St. Lawrence into the Atlantic—a system 2,400 m. long, and of great area, bearing an enormous traffic; the system chiefly E. of the Appalachians, draining by short and mostly unconnected streams into the Atlantic, and including such rivers as the Penobscot, Connecticut, Hudson, Delaware, Potomac, Roanoke, Savannah, and St. John's; the Mississippi system, including the great tributaries of that river, such as the Missouri, Ohio, Arkansas, and Red, and also some others discharging directly into the Gulf; and the Pacific system, including the Columbia, the Sacramento, and the Colorado.

From a geological point of view, the oldest part of the U. S. is the N. Appalachian region, that of hard rocks, separated from the softer recent rocks by the fall line on the rivers, forming generally the limit of their navigation. The most recent parts are the Great Plains. During the upheaval of the mountain chains lava was poured forth, and now covers great tracts, as in Idaho. The geysers of Wyoming show the remnants of this volcanic action.

The climate of the U. S. embraces all varieties from that of the tropics to that of the Arctic. Its chief peculiarity is the rapid alternation of temperature, due especially to the "cold waves" accompanying areas of high pressure. The flora is rich and varied, the giant sequoias of the Pacific coast being the most noteworthy trees. Large wild animals are rapidly disappearing; the largest are the moose of the N., the grizzly bears of the Rockies, and the buffalo of the plains, now practically extinct.

Population and Races.—The population, as ascertained by the decennial census of 1900, was 76,303,387, including Alaska. Including island possessions, this rises to 84,233,069. Increase of population, excluding Indians and Alaskans, has been as follows:

CENSUS.	Population.	Per cent. increase.	No. per sq. mile.
1790...........	3,929,214	.....	4.75
1800...........	5,308,483	35.10	6.41
1810...........	7,239,881	36.38	3.62
1820...........	9,633,822	33.07	4.82
1830...........	12,866,020	33.55	6.25
1840...........	17,069,453	32.67	8.29
1850...........	23,191,876	35.87	7.78
1860...........	31,443,321	35.58	10.39
1870...........	38,558,371	22.63	10.70
1880...........	50,155,783	30.08	13.92
1890...........	62,622,250	24.86	17.37
1900...........	75,847,735	21.01	25.06


PART OF UNITED STATES
SCALE OF MILES
0 50 100 150 200
EASTERN CANADA
SCALE OF MILES
0 50 100 150
DANISH WEST INDIES
SCALE OF MILES
0 5 10 15 20
PORTO RICO
SCALE OF MILES
0 10 20 30 40
A B C D E
1 2 3 4 5
Longitude 80° West from Greenwich
85° 75° 70° 65° 60°
45° 40° 30° 25° 20° 18° 15°
ONTARIO
LAKE SUPERIOR
QUEBEC
St. Lawrence
Gulf of St. Lawrence
NEWFOUNDLAND
NEW BRUNSWICK
NOVA SCOTIA
PRINCE EDWARD I.
Charlottetown
Halifax
Bay of Fundy
MAINE
NEW YORK
Montpelier
Augusta
Portland
Quebec
Montreal
Ottawa
Toronto
ONTARIO
MICHIGAN
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
WISCONSIN
ILLINOIS
INDIANA
OHIO
PENNSYLVANIA
NEW JERSEY
NEW HAMPSHIRE
VERMONT
MASS.
CONN.
R.I.
MARYLAND
WEST VIRGINIA
VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
FLORIDA
Chicago
Milwaukee
Detroit
Lansing
Columbus
Cincinnati
Cleveland
Indianapolis
Frankfort
Nashville
Harrisburg
Pittsburg
Philadelphia
New York
Albany
Boston
Providence
Trenton
Washington
Annapolis
Richmond
Charleston
Raleigh
Columbia
Atlanta
Montgomery
Tallahassee
Savannah
Wilmington
Charleston
Mobile
St. Augustine
Key West
Miami
ATLANTIC OCEAN
GULF OF MEXICO
Cape Hatteras
Cape Fear
Cape Charles
NANTUCKET I.
MARTHAS VINEYARD I.
LONG ISLAND
Tampa Bay
Charlotte Harbor
Bay of Florida
TEN THOUSAND IS.
ST. THOMAS I.
ST. JOHN I.
TORTOLA I.
SANTA CRUZ I.
Christiansted
Frederichsted
San Juan
Mayaguez
Ponce
Arecibo
CULEBRA
VIEQUES
STA. CRUZ I.

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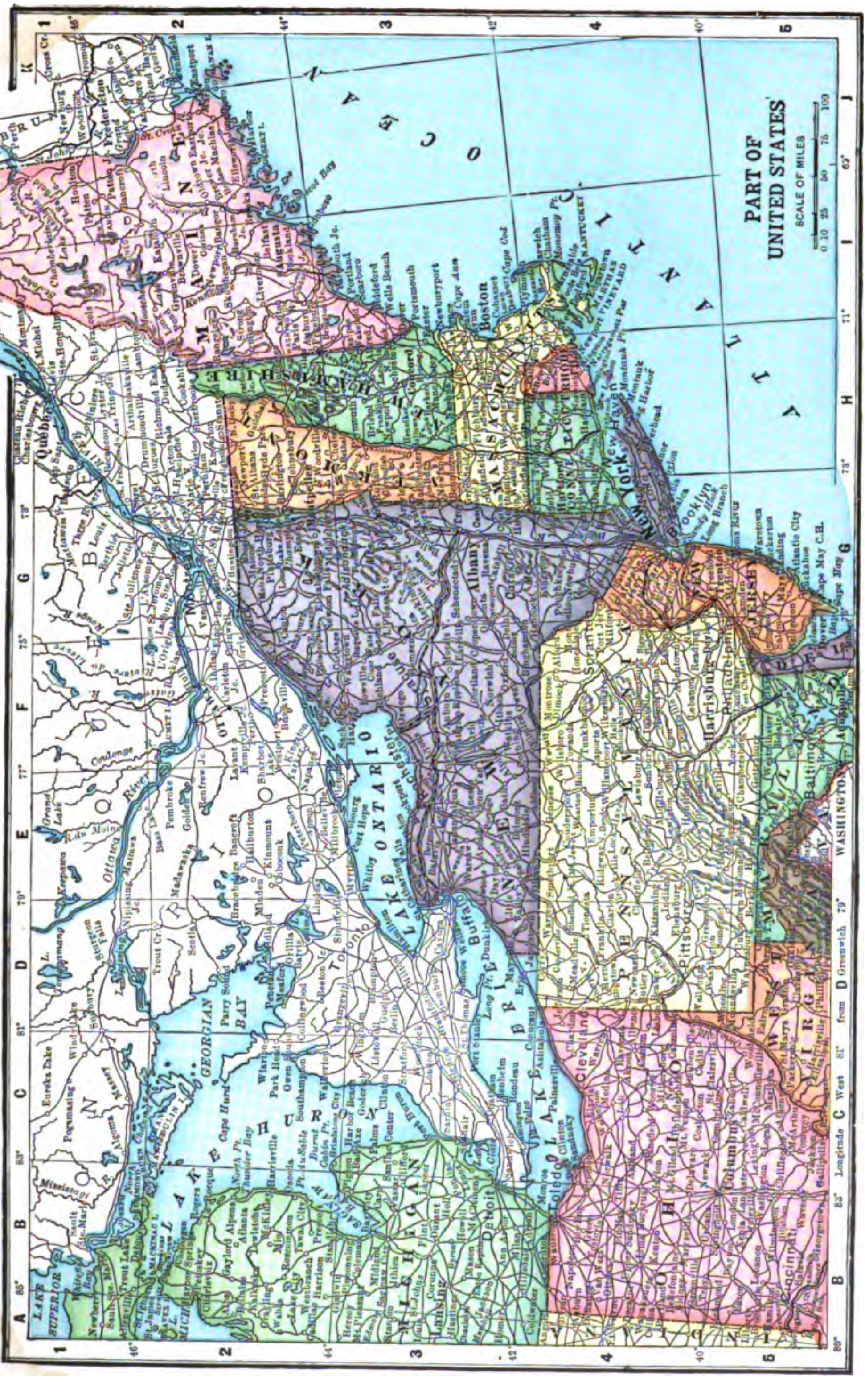


PART OF UNITED STATES

The total population was divided into 39,059,242 males and 37,244,145 females. Of the 65,843,302 native born, 33,329,130 were males and 32,514,172 females; of the 10,460,085 of foreign birth, comprising 10,250,063 whites and 210,022 colored, 5,730,112 were males and 4,729,973 females. Of the white population, numbering 66,990,802, 34,349,021 were males and 32,641,781 females; the Negroes, numbering 8,840,789, consisted of 4,393,221 males and 4,447,568 females; of the Chinese, 111,054 were males and 7,996 females; of the Japanese, 71,386 were males and 14,600 females; of the 266,760 Indians, 137,242 were males and 129,518 females. There were 1,768,078 infants under one year of age, and 3,504 persons over one hundred years old. The number of private families was 15,963,965, of which 14,042,546 had male and 1,921,419 female heads. Of 7,218,755 owners of their homes, 5,064,848 were native whites, 1,730,970 foreign whites, 372,444 Negroes, 48,219 Indians, and 2,274 Asiatics. Of the homes owned, 4,739,914 were free from encumbrance. There were 16,239,797 families altogether. The number of dwellings was 14,474,777. The foreign-born population is found chiefly in the N. states, only six per cent having gone into the S., and, except for the Scandinavians, it has gravitated principally to the cities, where it is often larger than the native element. Indians in tribal relations are segregated on reservations except in the case of the Five Civilized Tribes of Oklahoma. Since the admission of this state into the Union, tribal government here has nominally ceased, yet some of the tribes continue to elect officers.

The death rate of the entire population is 18 per 1,000. Among persons of foreign birth it is higher, and among the colored population of the cities it is sometimes double that of the whites.

Public Lands.—The U. S. became a large landowner through cession of unoccupied territory owned or claimed by states. These public lands have been cut up into townships (6 m. sq.), sections (1 sq. m.), and quarter sections. Actual settlers may obtain land for little more than the cost of survey. Grants have also been made to railways and for educational purposes. Of 1,625,000,000 acres (excluding Alaska), the U. S. had, up to 1902, disposed of 1,100,000,000 acres:

DISPOSITION OF PUBLIC LANDS.

	Acres.
Homesteads	352,000,000
Cash sales	224,000,000
Railway land grants patented	80,000,000
Swamp lands to States	70,000,000
Land bounties for military services	61,000,000
Timber culture grants	40,000,000
Forest reserves	60,000,000

Public Improvements.—During the early part of the nineteenth century many great public works, chiefly canals, were carried through by the individual states. After 1820 the greatest of such improvements were undertaken by the general government, and in 1850 the policy of aiding railroads by land grants was begun. (See SUBSIDIES.) In 1870 direct appropriation of money for river and harbor improvement was begun, and many millions are now spent annually for this purpose. In this way the jetty system at the mouth of the Mississippi, the Sault Ste. Marie Canal, and many other such works, have been built. The greatest of all, the Panama Interoceanic Canal, is now in course of construction.

Means of Communication.—Taking the country as a whole, railways may be said to have developed before systems of carriage roads. The automobile, coming into general use abt. 1905, has given great impetus to road building. In 1908 there were in operation about 233,677 m. of railway. (See RAILWAYS; TUNNELS.) The use of navigable rivers has decreased since the spread of railways, except in cases where the depth of water is assured, as with the Hudson. A systematic effort to restore traffic to the great rivers of the Mississippi basin is now being made. Canals were much used until the advent of railways checked their construction. Means of verbal communication are the postal service (carried on by the Federal Govt.) and the telegraph and telephone (in the hands of private corporations).

Industries.—Up to 1880 agriculture was the leading industry, and in 1890, although it was second in value of products, more persons were employed in it than in any other. Three quarters of the farms are operated by their owners. More than one third of those following gainful occupations are engaged in agricultural pursuits. The most important crops are cotton, produced mainly in the S. Atlantic and Gulf states; wheat, in the N. states of the Mississippi valley; Indian corn, chiefly in the middle W., though widely extended; oats, rye, barley, and buckwheat. Tobacco is a large and valuable crop, grown chiefly in the middle states with the northernmost of the S. group. Sugar cane and the sugar beet are important products. The increase of cultivable acreage by irrigation is now a settled policy of the country. Two fifths of the total area of the country may be thus reclaimed. (See IRRIGATION.) The leading industry of the country is now manufacturing. The number of factories increased forty per cent between 1880 and 1890. They are situated largely in the N. Atlantic states, though increasing in importance in certain sections of the South. Among the most important manufacturing industries are those of food products, textiles, iron and steel, lumber, leather, paper, liquors, chemicals, glass, metal products, vehicles, and shipbuilding. The patent system in the U. S. is far ahead of that in any other country. (See PATENTS.) Other important industries are those of mines and mineral production and fisheries. See the articles on these subjects.

Commerce.—Most of the commerce of the U. S. is internal, this portion being ninety-six per cent of the whole by volume and about ninety per cent by value. Exports are chiefly raw material, mostly agricultural and mineral products, and imports are sugar, coffee and tea, textiles, and metal products. Of ocean commerce, only nine per cent (1902) is carried in ships flying the American flag, seven eighths of American vessels being engaged in the coastwise trade and on internal waterways. The entire number of registered vessels in 1901 was 24,051, with aggregate tonnage of 5,524,218.

Government.—The Government of the U. S. is strictly limited in its powers to the functions specified in the Constitution, which was adopted in 1787. These functions are chiefly the maintenance of foreign relations, the establishment of postal communication, the regulation of interstate commerce, the levying of duties, and the maintenance of domestic peace. The great extensions of Federal power have been due chiefly to liberal construction of these specifications. Thus the control of interstate commerce has been held to imply power to prohibit the transportation of certain articles from one state to another unless these comply with the provisions of Federal statutes. Such statutes as the Pure Food Law are enacted on this understanding, and are inoperative so long as the products concerned do not cross state boundaries.

The Federal Govt. is divided into three great departments—legislative, executive, and judiciary—of which the first makes laws, the second executes them, and the third interprets them. Legislative powers are vested in a congress of two houses. One, the Senate, represents the states directly, each choosing through its legislature two members, regardless of size, for terms of six years; and the other, the House of Representatives, whose members are apportioned according to population and elected by the people, directly, in districts, for two years each. Each state, however, no matter how small its population, is entitled to at least one. It is customary to speak of the Senate as the "upper house," but, strictly, there is no warrant for this.

The executive power is vested in a President, who, together with a Vice President, is chosen nominally by an electoral college elected by the various states, each being entitled to a number equal to that of its combined Senators and Representatives in Congress. These electors are generally elected by the people, but a state legislature may and sometimes does prescribe some other way—choice by the legislature itself, for instance. They must, by act of Congress, be all chosen on the Tuesday after the first Monday in November. A majority is necessary to a choice, and failing such, the House of Representatives, voting by states, elects the President from the three highest candidates, and the Senate chooses the Vice President in like manner. As a matter of fact, candidates for these offices are nominated by national party conventions, and, as electors are pledged to vote for the candidates of their party, the election is practically by popular vote, except that, as the number of electors is not proportional to population, the successful candidate may not have received a popular majority. The President and Vice President (who serves as president of the Senate) serve for four years, and are eligible for reëlection, but custom forbids a third consecutive term. Both must be native-born citizens. The President is commander-in chief of the army and navy. He makes treaties (with the approval of two thirds of the Senate), appoints civil and military officers, and may prevent the passage of any law by withholding his approval (called the presidential "veto") unless such law is subsequently reapproved by two thirds of both houses of Congress.

In case of the death, resignation, or disability of the President during his term, the office passes first to the Vice President and then to a succession of officers designated by law, of which the first is the Secretary of State.

The President is aided and advised by a cabinet of nine officers, each of whom is at the head of an administrative department of the Government, namely, the secretaries of State, the Interior, the Treasury, War, the Navy, Agriculture, and Commerce and Labor; the Postmaster-general and the Attorney-general (the legal adviser of the Government). They are appointed by the President by and with the advice and consent of the Senate, and hold office during his pleasure. He may be governed by their advice or not, as he chooses.

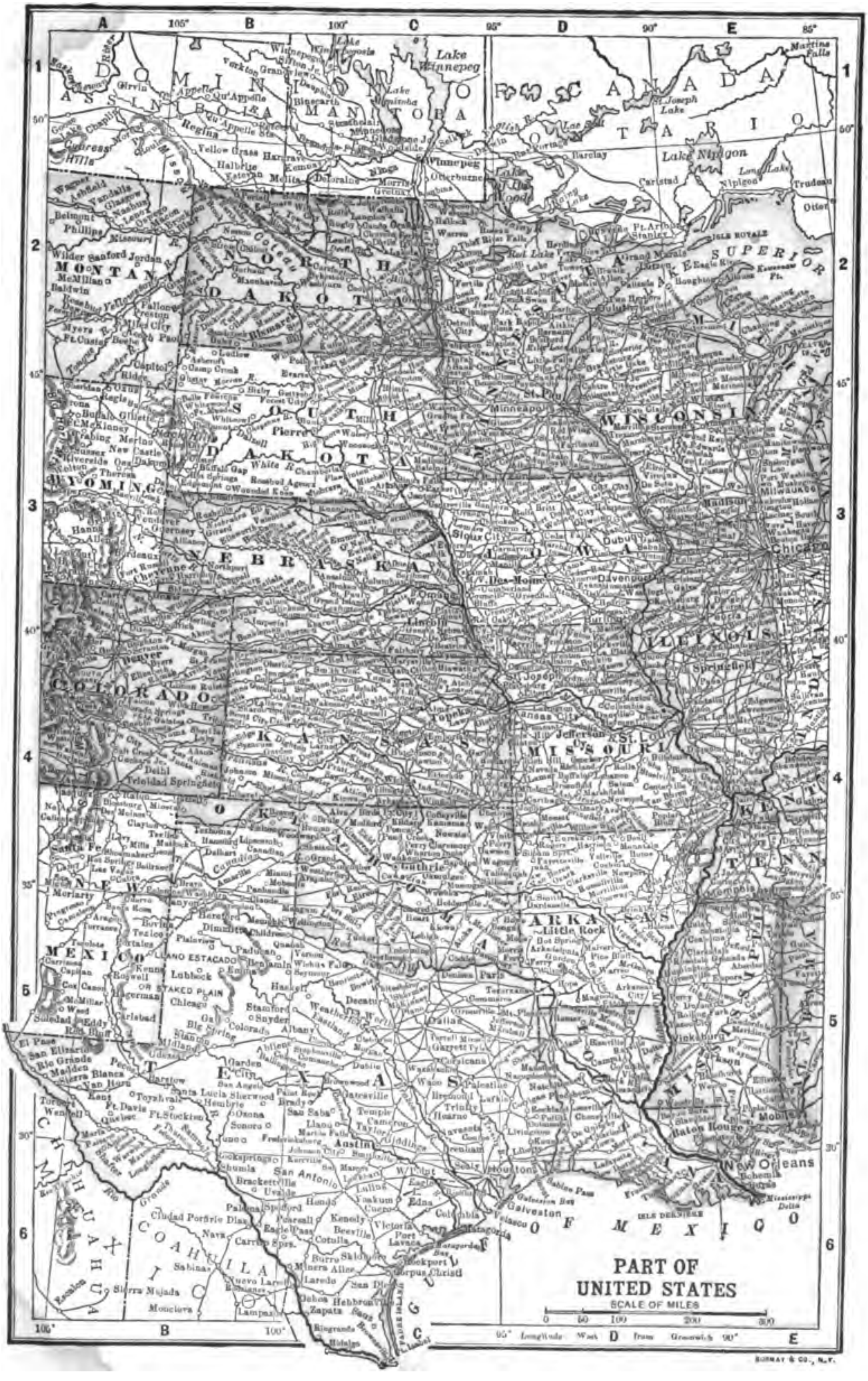
The judiciary consists of a Supreme Court (a chief justice and eight associates), circuit courts (held by a justice of the Supreme Court and a district judge), and district courts (held by the district judges alone). There are nine circuits, and each state forms one or more districts. All Federal judges are appointed by the President, and hold office during good behavior.

The political organization of the states is similar to that of the U. S., and in the case of the original states was, of course, preëxistent. Each has a governor elected by popular vote, a legislature of two houses, and a state judiciary. In the organized territories the President appoints the governor and other territorial officers, and the legislature is popularly elected.

States are usually divided into counties, and there are various forms of town and municipal governments. In New England the town is relatively more important than the county, while in some states it is subordinate to the latter.

Education.—Education is entirely in the hands of the individual states. The U. S. has a Bureau of Education in the Interior Department, but its functions are chiefly limited to the collection of statistics. All of the states have systems of common schools, generally managed and controlled very largely by counties or municipalities under state law. There are many colleges and universities—some private, others under state control. (See SCHOOLS; UNIVERSITIES.) Of recent years numbers of free public libraries supported by taxation have arisen. (See LIBRARIES.) Illiteracy is small, about three per cent of native whites in the N. states, about thirteen per cent in the S.

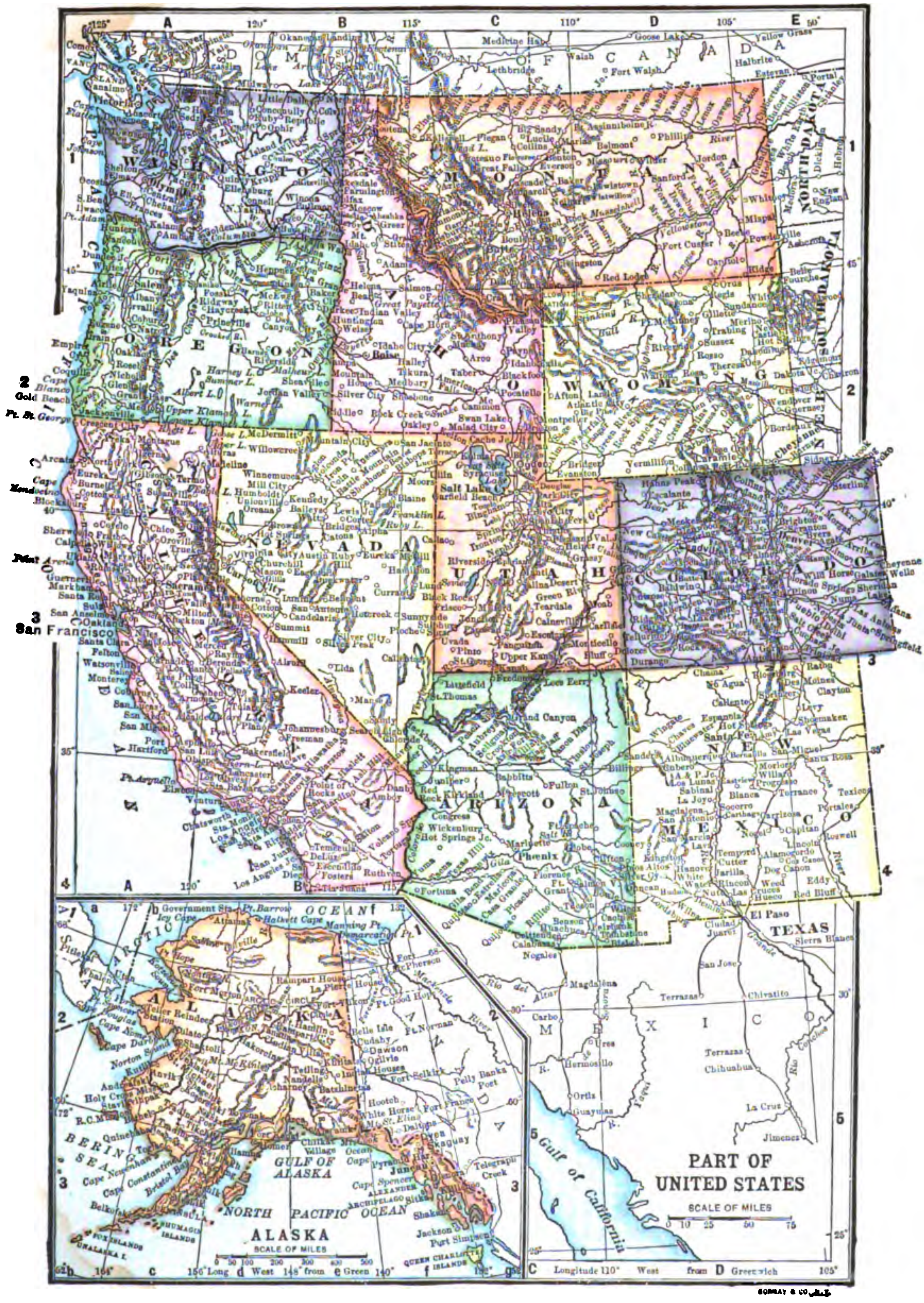
Army and Navy.—The regular army is recruited by voluntary enlistment, and consists, under the Act of February 2, 1901, of 100,000 men at most. (See ARMY.) The militia of the U. S. consists of all male citizens capable of bearing arms. As such, it is not organized, but most of the states maintain militia organizations, uniformed, armed, and more or less trained. Of late years these organizations re-



PART OF
UNITED STATES

SCALE OF MILES
0 50 100 200 300

UofM


PART OF UNITED STATES
SCALE OF MILES
0 10 25 50 75
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
COLORADO
ARIZONA
NEW MEXICO
TEXAS
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
DOMINION OF CANADA
MEXICO
Gulf of California
PACIFIC OCEAN
ALASKA
SCALE OF MILES
0 50 100 200 300 400 500
ARCTIC OCEAN
BERING SEA
GULF OF ALASKA
NORTH PACIFIC OCEAN
CANADA
2 Gold Beach
Pt. St. George
C. Arcata
Cape Mendocino
Point Arena
3 San Francisco
Longitude 110° West from Greenwich 105°
156° Long. West 148° from Green 140°

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ceive some practice in conjunction with the regular army.

The navy has 22,500 men, and some of the states maintain also a naval militia. (See NAVY.)

Finance.—Receipts of the Federal Govt. are derived from custom duties, internal-revenue taxes, the postal service, and miscellaneous sources. Disbursements are on account of maintenance of the various administration departments, interest on the public debt, and pensions. The public debt, which in 1866 amounted to $2,773,000,000, has now been reduced nearly to one third of this amount. The currency in circulation is chiefly paper, all of which is exchangeable at par for gold. This paper consists in part of gold certificates, in part of silver certificates, in part of the U. S. notes ("greenbacks"), and in part of guaranteed national-bank notes. Some gold also circulates and much silver, chiefly as fractional currency. All silver is now token money, no silver coin being intrinsically worth its face value. The Revenue and Expenditure for 1908 were as follows:

REVENUE.

Customs	$286,113,130
Internal Revenue	251,711,127
Postal Revenue	191,478,663
Profits on Coinage, Bullion, Deposits, etc	11,223,337
Sales of Public lands	9,731,560
Rev. of Dist. of Col	6,576,990
Fees, Consular, Letters Patent and Land	5,222,994
Sales of Indian lands, etc	3,575,835
Miscellaneous	26,971,146
	$792,604,782

EXPENDITURE.

Post Office Dept	$206,770,243
Military Est	139,927,465
Naval Est	118,780,233
Pensions	153,892,467
Int. on Pub. Debt	21,426,138
Panama Canal	38,093,425
Civil Est	148,972,740
Indian Service	14,579,756
Judicial	8,232,516
	$850,674,983

Religion.—The utmost religious freedom prevails, religious bodies being allowed to form and govern themselves at will, provided they keep within the limits of the civil law. Nearly all such bodies are avowedly Christian, and, although a religious complexion is nowhere given to the Government, many of its customs and acts presuppose a body of Christian, or at least of theistic, citizens. Such are the appointment of Christian chaplains for the houses of Congress, the exaction of oaths of office, mottoes such as "In God we Trust" on coinage and elsewhere. There are about twenty Christian denominations having membership of 50,000 or over, and numerous smaller ones.

History.—The early history of N. America is largely that of a struggle between the English and the French. The former established colonies along the Atlantic from Nova Scotia to Florida, and the latter, with the St. Lawrence and Canada as a base, pushed along the Great Lakes and down to the mouth of the Mississippi. The English claims to the country westward of their settlements conflicted with the French; hence several wars, in which the Indians generally fought on the French side. Finally, the so-called French and Indian War (1754–63) ended in the fall of Quebec, and put the British in possession of all the territory E. of the Mississippi. This war was the cause of the first important attempt to unite all the English colonies in America. A scheme of union was framed by a convention held at Albany, N. Y., in 1754, but rejected by the British authorities as conferring dangerous powers on the colonies. In 1765 delegates from nine colonies met at New York to resist the obnoxious Stamp Act passed by Parliament for colonial taxation, which was repealed in 1766. Further efforts of the mother country to raise revenue in the colonies, resisted by the latter as involving "taxation without representation," led to the first "Continental Congress" of 1774. It met in Philadelphia, all the thirteen colonies but Georgia being represented, and adopted a declaration of rights, denying the right of Parliament to tax the colonies.

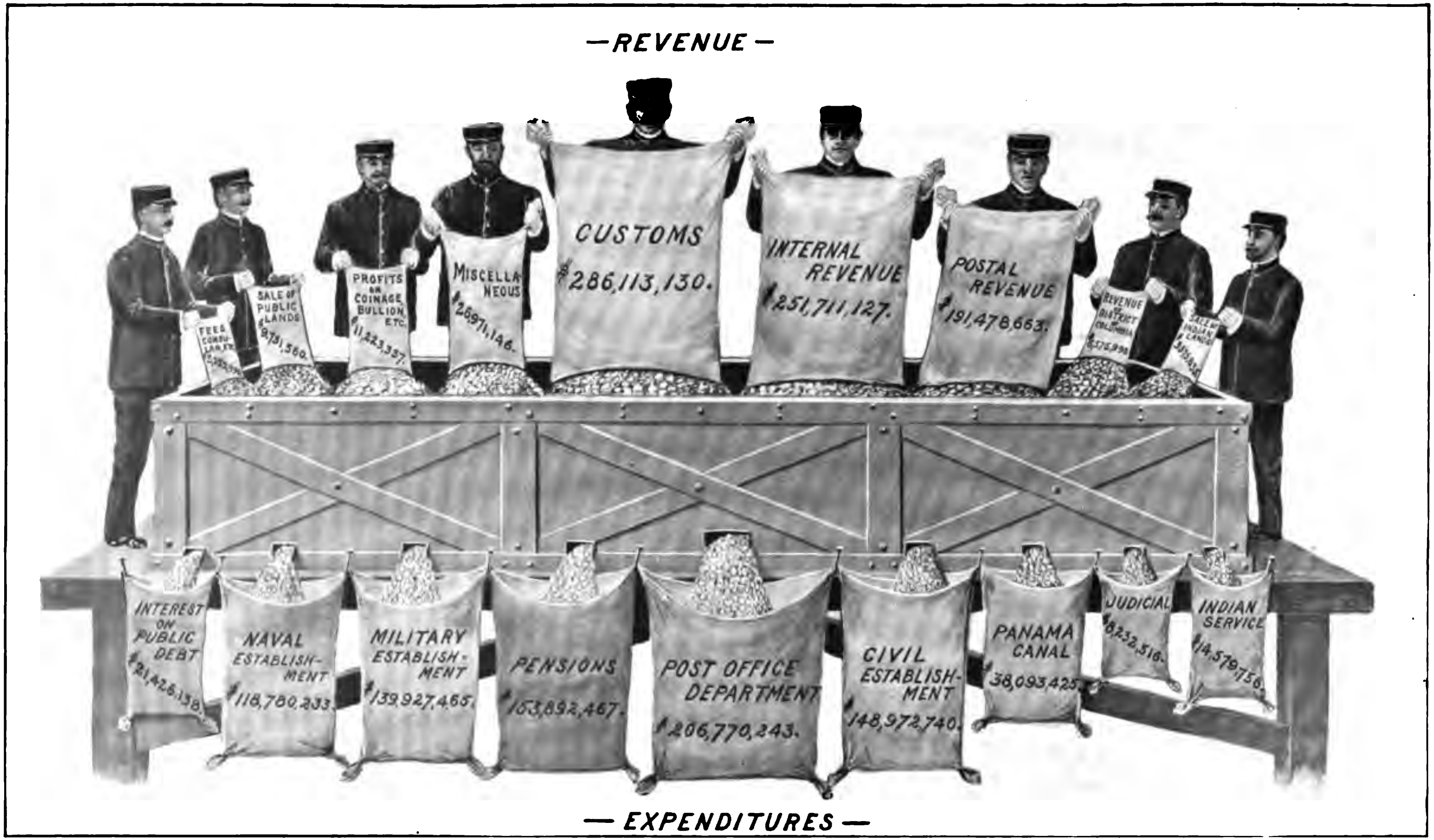
On April 19, 1775, occurred the battle of Lexington—an unforeseen conflict between colonial militia and British troops, and on May 10th following, the second Continental Congress met at Philadelphia. Armed resistance to Britain had not been contemplated, but the actual outbreak of war in New England, followed by the siege of Boston and the battle of Bunker Hill, resulted in the raising of a continental army by the Congress, the choice of George Washington as commander in chief, and, finally, in the adoption of the Declaration of Independence on July 4, 1776. Articles of confederation were adopted in 1777–81, the war during this time being prosecuted by a government without coercive power. Troops under Sir William Howe defeated Washington on Long Island, August 27, 1776, and drove him finally beyond the Delaware, afterwards pushing into Pennsylvania and capturing Philadelphia. Another British army, under Burgoyne, invaded the country from Canada, but after two severe battles was compelled to surrender to Gen. Gates near Saratoga, October 17, 1777—probably the turning point of the war. Shortly afterwards treaties of alliance and commerce between France and the U. S. were signed (February, 1778), and a French fleet was sent to aid the Americans. Philadelphia was evacuated by the British, but Sir Henry Clinton, carrying the war into the South, captured Savannah, Ga., and in April, 1790, Charleston, S. C., fell into his hands. The Americans were defeated at Camden, S. C. Gen. Benedict Arnold at this juncture entered into a treasonable compact with the British to surrender his post at West Point, N. Y., which was discovered and frustrated by the arrest and execution, as a spy, of Maj. John André. American successes at King's Mountain, N. C., and at Cowpens, Guilford, and Eutaw, finally culminated in the siege of Yorktown, Va., and its surrender with 8,000 men by Lord Cornwallis. A preliminary treaty of peace was signed in 1782, and a definitive treaty on September 3, 1783.

The existing confederation being without adequate authority, the Congress in 1787 summoned a convention to meet at Philadelphia, and this body submitted to the states the present Constitution, which went into operation on June 21, 1788, having been ratified by nine states, the four others shortly afterwards acceding. The new government was installed on April 6, 1789, by the inauguration of George Washington as first President of the U. S. Party lines were soon afterwards formed, dividing the country into Federalists and Anti-Federalists, or Republicans, the former favoring centralization and a strong national government, the latter opposing these measures and sympathizing with France. The Federalists held power through the administrations of Washington and Adams, but were defeated by Thomas Jefferson in 1800. War was waged with the Barbary pirates under the Bey of Tripoli from 1801–5. During this period, in 1803, Napoleon I sold to the U. S. for $15,000,000 the vast territory of France beyond the Mississippi. This is known as the "Louisiana Purchase." Napoleon's avowed object was to weaken Great Britain. In her efforts to resist France, Britain at this time exercised with great severity her alleged right to stop and search neutral vessels for subjects of her own, for impressment into her navy. Several exasperating incidents did much to hasten war, which was finally declared in 1812, under Madison's administration. This "War of 1812," which lasted until December 24, 1814, nominally effected little, but, in spite of the capture and burning of Washington by the British, American successes on the ocean and the lakes, which greatly enhanced the naval prestige of the U. S., and Jackson's decisive victory at New Orleans over Wellington's veteran troops under Sir Edward Pakenham, practically settled the question of search and impressment, although these were not mentioned in the treaty of peace.

This war closed the era of the history of the U. S. when foreign relations engrossed public attention. Financial and industrial questions now assumed importance, and chief among these were the tariff and slavery. In Monroe's administration, 1817–25, called "the era of good feeling," occurred Jackson's punitive expedition against the Seminole Indians of the then Spanish province of Florida, resulting in the annexation of Florida in 1819. At this time also was framed the so-called "Monroe Doctrine," proclaiming that interference of European countries on either American continent would be regarded as hostile to the U. S. Many new states were admitted to the Union about this time. Negro slavery had disappeared from the N. states, and the industrial situation in "slave" and "free" states began to be contrasted and discussed. It began to be a question at issue whether a new state should be "slave" or "free." In 1820 was adopted the so-called Missouri Compromise—the admission of Missouri as a slave state and that of Maine as a free state, with prohibition of slavery in all unorganized territory N. of 36° 30′. Soon after this the "Republicans" began to be known as "Democrats," under which name the party has since existed. The opposing party became known as Whigs. Under the administration of Gen. Andrew Jackson, the first Democratic President, the so-called "spoils system" of filling all offices with adherents of the victorious party became prevalent, and the issue of "nullification" arose—the alleged right of a state to act as the judge of the constitutionality of a Federal law affecting itself. The high-tariff acts of the administration were thus declared void by S. Carolina. War was prevented by the modification of the obnoxious measure and the mediation of Virginia. Jackson withdrew Government deposits from the Bank of the U. S., thus causing it to fail.

In the next administration, that of Van Buren, long-continued financial and industrial distress lost the Democrats their hold on the country, and Gen. W. H. Harrison, a Whig, was elected President in 1840. Harrison died suddenly a month after his inauguration, and John Tyler, the Vice President, who succeeded, quarreled with his party on the national bank question. At this time the Republic of Texas, a revolted province of Mexico, colonized largely from the S. states, had applied for admission to the U. S. A treaty of annexation prepared by the administration was rejected, and became the issue of the next election. James K. Polk, an advocate of annexation, was chosen President, but before his inauguration Congress had formally annexed Texas. The result, owing to boundary disputes, involved war with Mexico, which lasted from 1846 until 1848. Gen. Zachary Taylor occupied N. Mexico, and Gen. Winfield Scott landed an army at Vera Cruz and marched on the city of Mexico, ending the war by its capture. Mexico was forced to cede to the U. S. Texas, New Mexico, and upper California. During this war, boundary disputes with Great Britain in the NW. almost led to hostilities. The U. S. claimed territory as far N. as lat. 54° 40′, and one of the Democratic watchwords had been "Fifty-four Forty or Fight!" The forty-ninth parallel was finally agreed upon as a compromise.

The addition of so much territory, acquired from Mexico, in the S. now caused the slavery question to become acute again. In 1850 a compromise, proposed by Henry Clay, was adopted admitting California as a free state, but making extensive concessions to Texas, and endeavoring to secure the return of fugitive slaves by stringent provisions. Antislavery feeling now rose high in the North. Mrs. Stowe's "Uncle Tom's Cabin," published in 1852, did much to inflame public opinion, and Northerners became active in assisting fugitive slaves to escape to Canada. The repeal of the Missouri Compromise by the passage of the Kansas-Nebraska Bill, leaving the determination of the slavery question to the inhabitants, was a result of the so-called doctrine of "popular sovereignty" advocated by Stephen A. Douglas, of Illinois. The result was an immediate contest for the colonization of Kansas, accompanied by much violence, and amounting often to civil war, which continued nearly to the time of the war of 1861. In 1856 the Republican Party, formed to oppose the extension of slavery to the territories, nominated its first presidential candidate, Gen. John C. Frémont, who was narrowly defeated. Its second effort


—REVENUE—
FEES CONSULAR, ETC.
SALE OF PUBLIC LANDS $9,731,560.
PROFITS ON COINAGE, BULLION, ETC. $11,223,337.
MISCELLANEOUS $26,971,146.
CUSTOMS $286,113,130.
INTERNAL REVENUE $251,711,127.
POSTAL REVENUE $191,478,663.
REVENUE OF DISTRICT OF COLUMBIA
SALE OF INDIAN LANDS
INTEREST ON PUBLIC DEBT $21,426,138.
NAVAL ESTABLISHMENT $118,780,233.
MILITARY ESTABLISHMENT $139,927,465.
PENSIONS $153,892,467.
POST OFFICE DEPARTMENT $206,770,243.
CIVIL ESTABLISHMENT $148,972,740.
PANAMA CANAL $38,093,425.
JUDICIAL $8,232,516.
INDIAN SERVICE $14,579,756.
—EXPENDITURES—

THE ANNUAL REVENUE AND EXPENDITURES OF THE UNITED STATES GOVERNMENT.

four years later was successful, its candidate, Abraham Lincoln, being elected. The S. leaders now declared the Republican platform a menace to their constitutional rights, alleging their ability under the Constitution to withdraw from the Union. The S. states one after another seceded, and formed a separate government, entitled "The Confederate States of America," with Jefferson Davis as president.

After some hesitation the U. S. Govt., denying the right of secession, and incensed by the forcible seizure of Federal forts and property in the South, began preparations for asserting its position by arms. The war that followed lasted from 1861 till 1865, and consisted chiefly of two great movements, one in the East to capture the Confederate capital, Richmond, and another in the West, to gain control of the Mississippi valley. At the close of the war Gen. U. S. Grant forced Gen. R. E. Lee to surrender his army in the East, and Gen. W. T. Sherman, after a victorious march across Georgia and northward through the Carolinas, received the surrender of Gen. J. E. Johnston's army. Meanwhile, as a war measure, Pres. Lincoln, on January 1, 1863, had freed by proclamation all slaves in the seceded states. In 1865 slavery was definitely abolished by constitutional amendment. Lincoln was reelected in 1864, but in 1865 was assassinated by a S. sympathizer.

From 1865–77 the country was occupied with the political reconstruction of the S. states. The state governments were reorganized by the new President, Andrew Johnson, but Congress, alleging that the new governments sought to reëstablish slavery, refused to recognize them, and, conferring on the ex-slaves the right to vote, established in the former Confederate states governments largely dominated by the negroes and by N. immigrants known as "carpet baggers." There was much misgovernment, corruption, and anarchy, until finally, in 1877, U. S. troops were withdrawn from the South and the "carpet-bag" governments fell. The election of Rutherford B. Hayes to the presidency in 1876 was marked by a controversy that led close to civil war, the Democrats asserting that their candidate, Samuel J. Tilden, had been elected. The decision was left by Congress to an electoral commission, which decided in favor of Hayes. The Republicans continued to control the Government until the election by the Democrats of Grover Cleveland in 1884. Two Presidents, Garfield in 1881 and McKinley in 1901, fell by the hands of assassins. In the administration of the latter a war broke out with Spain over the course taken by the latter country in dealing with the Cuban revolutionists. Its outbreak was hastened by the explosion of the U. S. battleship *Maine* in Havana harbor, the U. S. claiming that the Spaniards were responsible. The close of the war saw the U. S. in possession of the Philippine Islands and Porto Rico, and also of Cuba, but after an independent government had been set up in that island the Cubans were left to themselves.

The administration of McKinley's successor, Theodore Roosevelt, was marked by efforts to restrain large agglomerations of capital, which had risen to abnormal power and influence. Legislation looking toward the national control of the railroads was passed, and efforts were made to bring great trusts and corporations to book for violation of laws intended to prevent restraint of trade. These efforts continued under the administration of William H. Taft (1909–), who announced his intention of upholding and continuing these and other somewhat radical policies of President Roosevelt.

United States Bank. See BANK.

United States Mil'itary Acad'emy, at West Point, was founded by the act of March 16, 1802. Between 1802 and 1812 there were only six instructors, of whom only from two to four were present at the same time, and there were only eighty-nine graduates. The uniform of the cadets, nearly the same as now worn, was prescribed by a general order in 1816. In the appointment of cadets it has been admitted as a principle that the sons of those who have lost their lives in the defense of the nation should have preference. The custom of appointing cadets from districts naturally arose in accordance with the tendency to distribute all appointments under the general government in proportion to representation, and was converted into a law in 1843. The monthly pay of cadets was $28 in 1802, $24 in 1845, $30 in 1857, in 1864 about $50; in 1885, $540 a year, and is now $709.50. A board of visitors, to attend the annual examinations and report on the condition of the academy, provided for in 1816 by regulation from the War Department, was discontinued by the Act of 1843; it was again authorized by Act of August 8, 1846, the members to be selected by the President from half the number of states annually, alternating with the other half; the number of members was reduced to seven in 1868; and to this number were added in 1870 two Senators and three members of the House of Representatives, to be designated respectively by the president of the Senate and the Speaker of the House.

In the present organization the general commanding the army has, under the War Department, supervision and charge of the academy. The staff of government and instruction consists of (1) the superintendent, directing the studies and exercises who has command over all persons belonging to the academy and the military post. The military staff includes an adjutant, quartermaster, commissary of subsistence, treasurer, surgeon, and assistant surgeon. (2) The commandant of cadets, an officer of the army, who is instructor of artillery, infantry, and cavalry tactics, also has charge of the discipline and administration, and commands the battalion of cadets. He has eight assistants, likewise army officers. (3) Seven commissioned professors, one professor detailed from the judge advocates of the army, an instructor of practical military engineering, and an instructor of ordnance and gunnery, taken respectively from the Engineer and Ordnance Corps; these (the superintendent and commandant included) constitute the academic board. There are about forty-three assistant professors and instructors, including those in tactics, and one swordmaster. Except seven professors, all officers and instructors of the academy are officers of the army detailed for the duty, usually for a period of four years. The academic board examines candidates for admission and cadets, recommends text-books, maps, models, etc., draws up programmes of instruction, etc., grants diplomas, etc. For the purpose of discipline and tactical instruction the cadets are organized as a battalion of four companies, each under the supervision of an instructor of tactics, with officers and non-commissioned officers selected from the cadets themselves. Usually cadet officers are selected from the first class, sergeants from the second class, and corporals from the third class. There are also a cadet adjutant, quartermaster, sergeant major, and quartermaster sergeant. The position of cadet officers affects their relation to other cadets only when on duty as officers.

Admission.—Each congressional district and territory, the District of Columbia, Alaska, Porto Rico, and Hawaii, is entitled to have one cadet at the academy. The appointments are made by the Secretary of War at the request of the representative or delegate in Congress from the district or territory of which the person appointed must be an actual resident. There are forty appointments at large specially conferred by the President of the U. S. The Secretary of War is authorized to permit not more than four Filipinos, one for each class, to receive instruction under the same conditions and regulations. Candidates must be between seventeen and twenty-two years of age, at least 5 ft. in height, free from any infectious or immoral disorder, and from anything which may render them unfit for military service. They must be well versed in reading, writing, orthography, arithmetic, elements of English grammar, descriptive geography, particularly of America, and history of the U. S. Those admitted are required to sign articles binding themselves to serve the U. S. eight years from date of admission, unless sooner discharged. An oath of allegiance to the U. S. is required.

The discipline is very strict—more so than in the army, and probably than in any other similar institution. The aim is to inculcate habits of prompt and cheerful obedience to lawful authority, of neatness, order, and regularity, and of thoughtfulness and attention in the discharge of duty. A scrupulous regard for one's word is required. The system of punishment for offenses is remarkable for inflexible enforcement rather than for severity. Besides demerit marks, which count in making up the class standing, cadets are further liable to three classes of punishment: (1) Privation of recreation, etc., extra duty, reprimands, arrests, or confinement to room or tent or in the light prison, reduction to ranks of officers and non-commissioned officers; (2) confinement in dark prison; (3) suspension, dismission with the privilege of resigning, public dismission. Punishments of the first class are inflicted by the superintendent or with his approval; that of the second class by sentence of a court-martial, except in case of mutinous conduct or breach of arrest. Monthly statements of conduct and progress in studies are sent to parents or guardians.

Upon graduating, the class is divided by the academic board into three sections of varying and unequal numbers, according to class rank; the highest, usually very small and sometimes wanting, is recommended for promotion in any corps in the army; the second, for any corps except the engineers; the third, in any corps except the engineers and the artillery. Commissions for the rank of second lieutenant are then usually conferred by the President.

United States Na'val Acad'emy was founded in 1845 by George Bancroft, Secretary of the Navy under Pres. Polk. For several years prior to this there was a school at the Naval Asylum, in Philadelphia, where the midshipmen prepared themselves for examination for promotion. The Naval School, as it was at first called, was formally opened October 10, 1845, in Fort Severn, at Annapolis, Md., which had been transferred by the War to the Navy Department for the purpose. The course was fixed at five years, of which the first and last only were to be passed at the school and the intervening three at sea. The first midshipmen that received a course of instruction and graduated from the school were those who entered the service in 1840. In 1850 the school was reorganized; the name was changed to the U. S. Naval Academy; the course was increased to seven years, the first and last two years to be passed at the school, the intervening four at sea; the number of instructors was increased and separate departments of instruction established; a vessel was provided and annual practice cruises instituted; and provision was made for an annual board of visitors to inspect and report upon the condition of the school to the Secretary of the Navy. In 1851 the requirement of sea service was abolished, leaving the course four consecutive years of study. At the outbreak of the Civil War, in 1861, the Naval Academy was removed to Newport, R. I., where it remained until the summer of 1865, when it was reëstablished at Annapolis.

At the head of the Naval Academy is the superintendent, a naval officer of high rank, who is assisted by the commandant of cadets and by the academic board, which is composed, in addition to the foregoing, of the heads of the different departments of study, who are, with one exception, naval officers.

The students of the Naval Academy are called midshipmen. Two midshipmen are allowed for each Senator, Representative, and delegate in Congress, two for the District of Columbia, and five each year from the U. S. at large. The appointments from the District of Columbia and five each year at large are made by the President. One midshipman is allowed from Porto Rico, who must be a native of that island. The appointment is made by the President on the recommendation of the Governor of Porto Rico. The congressional appointments are equitably distributed, so that as soon as practicable each senator, representative, and delegate in Congress may appoint one midshipman during each Congress. The course for midshipmen is six years—four years at the Academy, when the succeeding appointment is made, and two years at sea, at the expiration of which time the examination for graduation takes place. Midshipmen who pass the examination for final graduation are appointed to fill vacancies in the lower grade of the line of the navy in the order of merit as determined by the Academic Board of the Naval Academy. Should a member of Congress fail to fill the vacancy that may exist in the cadetship for his district by March 4th, the Secretary of the Navy is authorized to do so. The examinations for admission are held at Annapolis in May and September; the requirements, in addition to robust constitution, freedom from physical defects, and an age between sixteen and twenty years, are a knowledge of spelling, grammar, geography, history of the U. S., arithmetic, and algebra as far as equations of the first degree. The midshipmen are required to sign an engagement to serve in the navy for eight years, unless sooner discharged, and to make a deposit of $200 to cover the cost of outfit; the expenses of travel from their homes to Annapolis are refunded to them, and they receive $600 a year, but are required to pay for their subsistence, clothing, and other expenses.

Immediately after the annual examination the midshipmen of the graduating class are ordered to cruising vessels for the two years' service prior to final examination; the first and third classes, with the candidates that have been admitted, are embarked on board the practice vessels for the annual cruise of three months; the second class remains at the academy for practical instruction in the machine shop for a month, and then joins the others on the cruise. All the midshipmen, except those of the fourth class, are granted leave to visit their homes in September.

United Sy'nod of the Presbyte'rian Church, name taken by the S. members of the New School Presbyterian Church in the U. S. who withdrew in 1858.

U'nits, certain known quántities, of the same kind as the quantities to be measured, taken as standards of reference. Every expression for a quantity consists of two factors—the numeric and the unit. Thus 10 feet, 50 grams, 30 seconds.

A system of units contains as many different ones as there are quantities to be measured; they may be quite arbitrary, but it is convenient to connect them together in such a manner that they may be defined in terms of three arbitrary or underived units. These are called *fundamental units* in distinction from all others, which are *derived units*. The fundamental units are those of *length, mass*, and *time*. This selection is a matter of convenience. The standard unit of length in Great Britain is the imperial *yard*; in the U. S. it is the distance between the twenty-seventh and the sixty-third inch divisions of the Troughton scale. This at 59.6° C. is equal to the imperial yard. In France the unit of length is the *mètre des archives*. The standard of mass in Great Britain is the *avoirdupois pound*; in the U. S. it is the "troy pound of the mint," according to which the coinage of the U. S. is regulated. It is a certified copy of the lost imperial standard of 1758, and contains 5,760 grains. The avoirdupois pound adopted by the Treasury was derived from the troy pound, and contains 7,000 grains. In France the unit of mass is the *kilogramme des archives*.

By act of Congress in 1866 the meter was defined to be 39.37 in. The weights and measures of the metric system are lawful in the U. S., and the standards of length and mass are the "national prototypes" of the meter and the kilogram, made by an international commission, and preserved at the Bureau of Weights and Measures in Washington. They were authorized by a metric convention which was signed at Paris by the representatives of seventeen governments on May 20, 1875. The universal unit of time is the *second* of mean solar time. The C. G. S. or *centimeter-gram-second* system is based upon the centimeter, the gram, and the second as the fundamental units.

DERIVED UNITS.

(A) *Mechanical.*—The derived units will be defined in the C. G. S. system. The corresponding units for any other system are easily derived from them. The *unit of area*, the square centimeter, the area of a square with sides 1 cm. long; *unit volume*, the cubic centimeter, the volume of a cube with edges 1 cm. long; *unit velocity*, the velocity of a body moving through 1 cm. in 1 sec.; *unit of acceleration*, the acceleration which in 1 sec. produces an increase in velocity of 1 cm. a second; *unit force*, the *dyne*, or that force which acting on a mass of 1 gm. generates a velocity of 1 cm. per second (see DYNAMICS); *unit of work* and *energy*, the *erg*, the work done or the energy expended by 1 dyne through 1 cm.; *unit of power*, the power represented by the expenditure of 1 erg per second.

(B) *Electrical and Magnetic.*—Electrical units are either electrostatic or electromagnetic. The electrostatic units are based upon the phenomenon of the attraction and repulsion between charges of electricity, the law of which was established by Coulomb. The electromagnetic units are based upon the phenomenon of the magnetic field produced by a current, and they are derived from the definition of unit magnetic pole. The *electrostatic units* are: *Unit magnetic pole*, a magnetic pole which repels an equal and similar pole at a distance of 1 cm. with a force of 1 dyne; *unit magnetic field*, a field in which unit pole is acted upon by a force of 1 dyne; *unit current*, a current which, flowing in a circle of 1 cm. radius, produces at its center a magnetic field of 2 π units; *unit magnetizing force*, a magnetizing force producing unit magnetic field, equivalent to $\frac{10}{4} \pi$ ampere turns per centimeter length; *unit electromotive force* (E. M. F.), the electromotive force which does 1 erg of work per second when unit current is flowing; *unit resistance*, the resistance of a circuit in which unit E. M. F. produces unit current.

(C) *Practical Units.*—Since some of the C. G. S. units are inconveniently large and others inconveniently small, the practical units are some multiple or submultiple of ten times the corresponding C. G. S. units of the electromagnetic system. The practical units are: *Unit of resistance*, the *ohm*, represented by the resistance offered to an unvarying current by a column of mercury at the temperature of melting ice and 14.4521 gm. in mass, of a constant cross-sectional area, and 106.3 cm. in length; *unit of current*, the *ampere*, which is the practical equivalent of the unvarying current, which, when passed through a solution of silver nitrate in water, deposits silver at the rate of 0.001118 gm. per second; *unit of electromotive force*, the *volt*, or the E. M. F. that, steadily applied to a conductor whose resistance is 1 ohm, will produce a current of 1 ampere; it is equivalent to $\frac{1000}{1434}$ of the E. M. F. of the Clark cell at a temperature of 15° C.; *unit of quantity*, the *coulomb*, which is the quantity transferred by 1 ampere in 1 sec.; *unit of capacity*, the *farad*, the capacity of a condenser charged to a potential of 1 volt by 1 coulomb; *unit of work*, the *joule*, the energy expended in 1 sec. by an ampere in an ohm; *unit of power*, the *watt*, the work done at the rate of 1 joule per second; *unit of induction*, the *henry*, the induction in a circuit when the E. M. F. induced is 1 volt while the inducing current varies at the rate of 1 ampere per second.

The relation between these practical units and the C. G. S. units is set forth in the following table:

PHYSICAL QUANTITY	Practical Unit.	RATIO OF PRACTICAL TO C. G. S. UNITS.	
		Electromagnetic.	Electrostatic.
Quantity	Coulomb	10^{-1}	3×10^{9}
Current	Ampere	10^{-1}	3×10^{9}
Electromotive force	Volt	10^{8}	$\frac{1}{3}\times10^{-2}$
Resistance	Ohm	10^{9}	
Capacity	Farad	10^{-9}	9×10^{11}
Induction	Henry	10^{9}	
Work	Joule	10^{7}	
Power	Watt	10^{7}	

Univer'salism, in theology, the doctrine that all mankind will finally attain salvation. In 1900 the General Convention adopted the following "statement of essential principles": (1) The universal fatherhood of God; (2) the spiritual authority and leadership of His son, Jesus Christ; (3) the trustworthiness of the Bible as containing a revelation from God; (4) the certainty of just retribution for sin; (5) the final harmony of all souls with God.

Universalism began its development in America in the last half of the seventeenth and the first half of the eighteenth centuries through certain English and French mystics, through the German Brethren, the Moravians, and through a few learned divines of the Episcopalian and Congregationalist bodies. John Murray came from England in 1770, and began to proclaim it openly. Its doctrines spread rapidly, but it acquired institutional power slowly. The organization of the Universalist branch of the Christian Church in America was accomplished in 1803, at Winchester, N. H. The Church in America now numbers more than 50,000 communicants.

Univer'sal Lan'guage. See ESPERANTO; VOLAPÜK.

U'niverse, a term employed to signify the grand and total aggregate of created things. Regarding this aggregate as a material structure, it is, so far as we know, made up of what we familiarly call the heavenly bodies. Particulars respecting these bodies and the systems which they form are found in the articles ASTRONOMY, COMETS, NEBULÆ, etc.

Univer'sity, one or other of various institutions for higher education, in mediæval or modern times. The name is applied at present to bodies of very different types, of which the chief are, perhaps, as follows:

(1) The German type, under the ultimate authority of the state, including generally faculties of philosophy, medicine, law, and theology. The ordinary academic studies, such as literature, language, history, mathematics, etc., are included in philosophy. Laboratories and institutes for special studies may be included, but not technical schools. Instruction is chiefly by lecture and the student is under little discipline. Degrees are given as a result of one final examination. Such are the universities of Berlin, Bonn, Leipzig, Göttingen, etc. (2) The French type, established by Napoleon in 1808. Nearly all the educational bodies in the country are united into the Univ. of France, controlled by the Ministry of Public Instruction. Some of the old universities suppressed by Napoleon (Montpellier, Lyons, etc.) have now regained something of their former prestige.

(3) The English type, embodied in the univs. of Oxford and Cambridge, each of which is a group of associated colleges, semi-independent. The university appoints professors, examines candidates, and confers degrees, while the colleges enroll students and care for their discipline and instruction. (4) The Univ. of London type—a mere examining body, like the Board of Regents in the State of New York.

Universities in the U. S. have scarcely succeeded as yet in evolving a distinct type, although most of them approach the German in being groups of separate faculties. In many, faculties considered essential by the Germans are absent, and in many, technical schools and other instructional bodies barred out in Germany are included. Students are generally received in earlier stages than in Germany, so that the instruction given combines that of the German gymnasium and the university. In many American institutions the German university course is represented roughly by what we know as the postgraduate course—that pursued, if at all, after taking the degree of Bachelor of Arts in a regular four-year course.

The E. universities, unconnected with the state, were formerly the largest bodies of this kind. They may be typified by Harvard, Yale, and Princeton (in order of foundation). Of late the state universities of the middle W., such as Michigan, Illinois, Wisconsin, and Minnesota, have made great strides, and are now among the largest and most important educational bodies in the country. Many universities were, and some still are, under denominational control. Some are nominally so, but practically free. As no law exactly defines the meaning of the word "university," the name is still applied in the U. S. to smaller teaching bodies, really small colleges, or even high schools.

The word university in its academic sense is mediæval. The origin of modern universities is dated from Salerno, Bologna, and Paris in the twelfth and thirteenth centuries, yet the real beginnings of these and kindred institutions are lost in the remote past. In the thirteenth and fourteenth centuries large numbers of European universities were founded. Germany, though not the original seat of the modern university, has been its most congenial home.

University Exten'sion, an educational movement, the main idea of which is to furnish teaching by university instructors to those who, for any reason, cannot reside at the universities. Its constituency is the large class of people, itself made up of all classes, in the towns and cities who wish to read and study under such direction as colleges and universities can give through the living teacher. University teaching is extended principally by three methods: (1) By lectures conducted by the university instructor, with special aids for student work in the interval; (2) by correspondence, lesson sheets being prepared and mailed to the student, with test exercises for work; (3) by means of classes organized in the neighborhood of the university itself. Usually the second and third varieties of university extension instruction are sought by those who, while they cannot become residents at the universities, desire to pursue courses parallel to those pursued in the universities. The method first described is that usually denoted by the term university extension, and is especially suited, not to those who desire to pursue, as non-resident students, the courses laid down in the curricula of universities, but rather to those in every walk of life who desire a broader view of subjects taught in the universities.

The distinctive features of university extension lectures are (1) the connected series instead of the single lecture, and (2) the aids to student work already referred to. These consist of (*a*) the syllabus or printed outline of the lecture; (*b*) references for reading designated by the lecturer; (*c*) the traveling library, bearing upon the subjects discussed; (*d*) the review hour in connection with each lecture, affording opportunity for familiar discussion; (*e*) the written paper upon topics suggested by the lecturer and designated in the syllabus. The performance of all work is voluntary with the student. After or before the lecture hour the lecturer reviews and discusses the preceding lecture with such of his hearers as desire this. In this exercise use is made of such written papers as members of the audience may have furnished. Those attending the lectures thus have the opportunity, the use of which is entirely voluntary, of reading some or all the works assigned, and, further, of writing for examination and comment short papers on designated topics. Usage varies in the different colleges as to the recognition accorded to those who do the work. In some cases a certificate of readings performed and written exercises rendered is given to the student in the name of the university. In the case of courses of twelve lectures, where the nature of the course permits it, the student who performs all the designated work and takes the university examination is, by some institutions, allowed credit as a nonresident student of the university, and this credit stands in his favor if he at any time becomes a resident student.

University of the State of New York, an organization including all incorporated institutions of academic and higher education in New York, with the State Library, State Museum, and such other libraries, museums, or other institutions for higher education in the state as may be admitted by the regents to the university. It was incorporated, May 1, 1784; reorganized, 1787; had its powers enlarged, 1892. In 1904 the university and the Department of Public Instruction were consolidated, and the powers and duties of each are now those of the university, and the Commissioner of Education is its chief executive officer. The object of the university is to encourage and promote higher and secondary education, and may establish such rules and regulations as are necessary to carry into effect state statutes relating to education, subject to such restrictions and limitations as are imposed by law.

The powers of the university are vested in twelve regents. Regents are elected by the two houses of the state legislature in joint session, in the same manner as Senators of the U. S., and serve without salary for twelve years.

The regents have power to grant charters to colleges, academies, libraries, museums, or other educational institutions, and to alter or repeal such charters. They are required to visit and inspect the condition and operation of every institution in the university, and may require annual reports under oath of their presiding officers, and award and confer suitable certificates, diplomas, and degrees. They may confer honorary degrees. No educational institution may confer degrees unless such institution shall have the required resources (value at least $500,000), and be approved as to the sufficiency of equipment by the regents.

The annual meeting of the regents is held on the second Thursday of December in each year. Other meetings are held as called by the chancellor about once every two months, except during July, August, and September.

The university convocation of the regents and the officers of institutions belonging to the university, for consideration of subjects of mutual interest, is held annually at the capitol in Albany on such days as the chancellor and Commissioner of Education shall determine.

University Set'tlements, homes in the poorer quarters of a city, where educated men and women may live in personal contact with the working people. Here they may identify themselves as citizens with all the public interests of their neighborhood, may coöperate with their neighbors in every effort for the common good, and share with them, in the spirit of friendship, the fruit and inspiration of their wider opportunities. Such settlements began through the labors of Edward Denison and Arnold Toynbee, of Oxford Univ., among the poor of Whitechapel, London. The work is now carried on at such centers as Toynbee Hall, London, and Hull House, Chicago, and has spread to most large cities.

Upan'ishads (Sanskrit), a group of over one hundred mystical treatises, mostly in prose, attached to the Brahmanas or ritualistic precepts which form the second division of the Veda. They contain the beginnings of Hindu philosophy, and cast aside matters of rites and ceremony to deal with the mysteries of creation and existence.

Upas (ū'păs), a tree found in the forests of Java, where it is called *Bohun apas*; the scientific name is *Antiaris toxicaria.* The thick juice of the plant dries into a resinous mass, which is extremely poisonous, and used by the natives on their arrows. The stories respecting the pernicious character of exhalations from this tree are exaggerations. Specimens of the plant are cultivated in botanic gardens. The plant belongs to the breadfruit family. A fabric is woven from the bark.

Upsala (ŭp-să'lă), town of Sweden, of educational and historic interest; 45 m. NW. of Stockholm, on the river Tyris. The cathedral was built between 1289 and 1435. Its interior is magnificent and richly decorated, but its exterior has suffered from fire. Among its relics are the silver shrine of St. Eric, the tomb of Gustavus Vasa, the monument to Linnæus, etc. The university was founded in 1477 by Sten Sture, developed rapidly, produced a great number of illustrious scholars, and at times exercised a decisive influence on Swedish civilization. Pop. (1907) 24,635.

Up'ton, Emory, 1839–81; American soldier; b. Batavia, N. Y.; graduated at the U. S. Military Academy, 1861, and commissioned second lieutenant of artillery; served in the Civil War, and twice wounded; in 1866 was transferred to the Twenty-fifth Infantry with rank of lieutenant colonel, and engaged in perfecting a "System of Infantry Tactics," which was adopted, 1867, for the use of the army and militia of the U. S.; commandant of cadets at West Point, 1870–75; on professional duty in Asia and Europe, 1875–77; commanded several artillery posts, and was on the board to codify army regulations, 1878–81. He received the brevets from major to major general in the U. S. army.

Uræmia (ū-rē'mĭ-ă), a condition resulting from the imperfect action of the kidneys, whereby substances which would normally be excreted are retained in the blood. It occurs especially in Bright's disease; the symptoms are headache, convulsions, delirium, nausea, etc.

Ural (ū'rŭl), river of Russia, which rises in the Ural Mountains, flows S., forming the boundary between Europe and Asia, and enters the Caspian Sea after a course of 930 m. It is not navigable on account of sand banks, but is rich in fine fish, particularly near its mouth, where the Cossacks have important fisheries. Its delta is large and increasing.

Ural Moun'tains, a range of plateaus rising from 3,000 to 5,000 ft., and with a breadth of from 16 to 66 m. They begin at the Arctic Ocean, in lat. 70° N., and stretch S. to lat. 50° N., forming the natural boundary between Europe and Asia. Highest point, Telpös-is (5,526 ft.). They are rich in gold, platinum, copper, iron, and other ores. Of precious stones, beryl, topaz, amethyst, and diamonds are found; coal is abundant. The Obdorsk Mountains branch off from the middle chain of the Urals, and extend 500 m. NNW.

Urania (ū-rā'nĭ-ă), in Grecian mythology, one of the nine muses, the goddess of astronomy, and a daughter of Zeus and Mnemosyne. She was generally represented as holding a celestial globe in the one hand and pointing at it with a small staff in the other. The name is also applied to Venus as the type of noble love.

Uran'inite, or **Pitch'blende,** a pitch-black mineral with a specific gravity of 9.5. It is found at Joachimstal, Bohemia, in sufficient quantity for commercial purposes; also in Cornwall, England, and other localities. In addition to uranoso-uranic oxide (UO), it contains lead sulphide, silica, lime, etc., and from 1 to 2.5 per cent of a gas which was first supposed to be nitrogen, but in 1895 was shown to be a mixture of the gases argon and helium. Its chief interest at present is that the newly discovered element, radium (*q.v.*) can be separated from it.

Ura'nium, a metal obtained from the mineral pitchblende. It is hard, somewhat malleable, and in color resembling iron. Uranium compounds impart to glass a greenish-yellow fluorescent color and a fine orange color to porcelain; they are also used in photography.

Uranium Rays. See BECQUEREL RAYS.

U'ranus, in Grecian mythology, the son of Gaia, the earth, and by her the father of the Titans, the Cyclopes, Hundred-handed, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gaia, Cronus, the youngest of them, overthrew and dethroned him.

Also the name of the seventh planet in the order of distance from the sun, and, with the exception of Neptune alone, the outermost member of the planetary family. Uranus travels at a mean distance of 1,753,869,000 m. from the sun, but its orbit is very eccentric. Its year, or period of complete revolution around the sun, is equal to 84 years and 6.5 days of our time. The mean diameter of Uranus is about 33,000 m. Its volume exceeds the earth's about seventy-four times, but its mean density is so small (0.17—the earth's as 1) that its mass exceeds that of the earth only about 12½ times. It has been said that Uranus rotates on its axis in 9½ hours. Uranus was discovered by Sir William Herschel in 1781. He proposed to call it Georgium Sidus, in honor of George III. Continental astronomers long called it Herschel, but the name Uranus is now universally adopted. Uranus has four satellites—Ariel, Umbriel, Titania, and Oberon—which differ from other satellites in our system in that their orbits are almost perpendicular to Uranus instead of revolving in the same plane.

Ur'ban (Latin, Urbanus), the name of eight popes, the following being the more notable: Urban I, abt. 222–230, son of Pontianus, a Roman noble; a martyr, according to somewhat doubtful authority. Urban II, Othon de Lagny, 1088–99; b. at Châtillon-sur-Marne, France, abt. 1042; was successively a disciple of St. Bruno, canon of Rheims, and monk of Cluny, where Gregory VII made his acquaintance, and invited him to Rome, made him cardinal and Bishop of Ostia, and named him among those worthy of the succession. The main object of Urban's life was the continuation of the policy of Gregory VII against the lay investitures, simony, and priestly concubinage. Henry IV and the antipope Guibert of Ravenna (Clement III) maintained for a long time possession of all or part of the city of Rome, and much of Urban's life was spent outside the city. In the eleven years of his pontificate he bore up manfully against the emperor, helped in turn by the rebellion of the latter's son Conrad, by the marriage of the Countess Mathilda to Welf, the son of the Duke of Bavaria, by King Roger of Sicily, and by the first crusaders. Urban held a number of councils in S. Italy for the reformation of manners and the maintenance of the independence of the Holy See, notably that of Bari, at which St. Anselm of Canterbury assisted. Urban died in Rome, 1099, fourteen days after the capture of Jerusalem.

Urban V, Guillaume Grimoard, 1362–70; a Benedictine monk; distinguished professor of canon law and Scripture; Abbot of St. Victor at Marseilles and papal legate. Yielding to the necessities of the situation and to the entreaties of such persons as Petrarch and St. Bridget of Sweden, he returned from Avignon to Rome, 1367, and ended the long exile of the popes. But his love for France drew him back again to Avignon, where he died, 1370. He was a mild-mannered, studious man, the friend of scholars, and founder of a school of medicine at Montpellier. Urban VI, Bartolommeo Prignani, (1378–89); Archbishop of Bari; elected April 8, 1378. Shortly after his election the French cardinals elected antipope Cardinal Robert of Geneva (Clement VII, 1378–94). Thus the papacy was divided, and the great schism of the West inaugurated. The hasty, impetuous temper of Urban did not aid matters; his latter days were embittered by the ill success of his plans in Naples and by the conspiracy of his own cardinals, who tried to create a kind of tutorship for him, but paid for it with death or imprisonment. Died in Rome, 1389. Urban VIII, Maffeo Barberini, 1623–44; built the Collegium Urbanum, or College of the Propaganda; established the Vatican Seminary; strengthened the fortifications of Rome; gave to the cardinals the title of eminence; regulated the number of feasts of obligation; issued an emendated breviary, in which the ancient Christian style in the hymns was replaced by classic exactness of meter. He has been accused of nepotism and of furtherance of French interests in the Thirty Years' War. To his pontificate belongs the condemnation of Galileo by the Congregation of the Holy Office. He canonized Loyola. Died in Rome, 1644. Urban was a man of polished manners and literary tastes, gentle and refined.

U'rea, or **Car'bamide,** an organic compound whose chemical formula is $CO(NH_2)_2$. It is an essential constituent of the urine of mammiferous animals, particularly of the carnivora, but is also found in that of birds and of amphibia. Urea also occurs, to some extent, in human blood and perspiration, in the vitreous humor of the eye, and in the lymph and chyle of various animals. It is the chief outlet for the oxidized nitrogen of the tissues of the system, a healthy adult excreting more than an ounce daily. It is not formed in the kidneys, which appear merely to separate it from the blood, in which it is preëxistent. Urea may be formed artificially in several ways, and possesses special interest as being the first organic compound so prepared.

Ure'ter, the excretory duct of the kidney. In man it is a cylindrical membranous tube about 17 in. long and as large as a goose quill, passing from the kidney to the bladder. It has a fibrous (or outer), a muscular, and a mucous (or inner) coat. Each kidney normally has a distinct ureter.

Ure'thra, the canal by which the urine is emptied from the bladder. In the female it is but a short passage opening below the clitoris. In the male it is about 8 to 9 in. long and of a somewhat complicated structure, conducting not only the urine, but also the semen. Going from the bladder outward, the urethra is divided into three parts: (1) The prostatic part, surrounded by the prostate gland, in which (part) are the openings of the seminal ducts; (2) the membranaceous part, 8 to 10 lines long; and (3) the cavernous or spongy part, surrounded by the penis. The caliber of the urethral canal is different in the different parts and different individuals, and ranges from 3 to 7 lines in diameter, the orifice being the narrowest part. The urethra is lined throughout with delicate mucous membrane, which is a direct continuation of that of the bladder.

U'ric Ac'id, or **Lith'ic Acid,** a substance first discovered by Scheele in 1776; formula, $C_5H_4N_4O_3$, which occurs in a small proportion in human urine, but is much more abundantly contained in the excretions of insects, land reptiles, and birds. It is extensively found in the guano beds of the Pacific islands; also in the blood, which latter, in certain diseases, as gout, contains a considerable amount; indeed, in persons suffering from gout it often accumulates around the joints, forming what are commonly but incorrectly termed "chalk stones," which consist chiefly of sodium urate. When secreted in excess it is discharged by the kidneys, and is deposited from the urine as red gravel, or it accumulates in the bladder and forms a constituent of urinary calculi. It is almost insoluble in water, requiring 10,000 parts of cold water, and is quite insoluble in alcohol and in ether. Uric acid had been artificially produced. Its presence can often be recognized under the microscope by its peculiar crystalline structure—rhombic tablets and dumbbell-shaped crystals.

U'rim and Thum'mim, sacred symbols of the high priest of Israel given at Sinai (Ex. xxviii, 30), but lost forever at the destruction of the first Temple (Ez. ii, 63; Neh. vii, 65). They were two objects placed in a pocket behind the breastplate of the high priest, and used to cast lots or to receive answers to questions, and thus determine the divine will. It is not known just how the divine will was learned. In the Septuagint translation of 1 Samuel xiv, 41, the following description of their use occurs, and this is the clearest knowledge we have: "And Saul said, Lord God of Israel, why hast thou not answered thy servant to-day? If I or Jonathan my son has sinned, then Lord God of Israel give 'light'; but if it be thy people Israel who have sinned, then give 'right.'" The questions to be answered by the Urim and Thummim were public, and not private, and only the high priest could use them.

U'rinary Cal'culi and Depos'its. Urine in disease often deposits various sediments, which differ in properties and composition according to the causes which induce their formation. They include blood, pus, epithelial cells, etc., and urates, uric acid, phosphates, calcic oxalates and carbonates, etc. The most common urinary sediment is that known as lateritious or brick-dust deposit. It occurs in health when active perspiration or free movement of the bowels renders the urine concentrated. It is a constant symptom in excessive urinary acidity, as in gout. If small masses are voided, they are spoken of as gravel; if larger masses, as calculi or stones. Uric acid and urate stones are especially prone to form in the kidney. The same conditions which occasion urates in the urine frequently cause calcium oxalate also to appear. The latter may be due likewise to certain vegetables and fruits rich in oxalates, and is then less significant. Oxalate calculi are usually formed in the kidney; they are generally of a mulberry appearance. Phosphates may appear in the urine as a whitish sediment, and may cause the white or mixed phosphatic calculi in the bladder. A stone in the kidney may cause no trouble, but when it passes down the ureter it causes the agonizing pain of renal colic.

Calculi are liable to cause serious obstructions to the flow of urine, and also severe inflammatory conditions of the pelvis of the kidney and of the bladder. But the inflammatory conditions may in the first place cause the calculi by favoring the deposit of the urinary salts, and the calculi afterwards aggravate the original trouble. Once formed, medication probably has no power to dissolve calculi. Occasionally they break spontaneously, and are discharged as fragments. Their formation is often preventable by careful medication, the use of waters, and care in diet, exercise, etc. Their removal when necessary involves cutting, crushing, or other operations. See LITHOTOMY.

Urinary Or'gans. See KIDNEY.

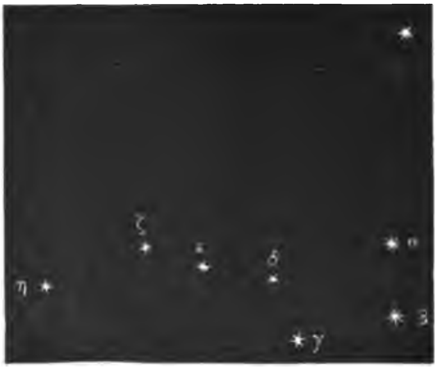
U'rine, a fluid excreted by the kidneys. Urine in health possesses a light amber color, a slight acid reaction, a peculiar odor, and a bitter saline taste. During the process of digestion it sometimes acquires an alkaline reaction. It has a specific gravity of from 1.000 to 1.070, but this changes with the diet and health of the individual. It becomes more strongly alkaline on standing, owing to ammoniacal decomposition. The urine excreted in the morning has a different composition from that passed in the evening, which has absorbed various substances taken into the stomach during the day. An average sample of healthy human urine has the following composition:

In 1,000 parts, water = 956.80 parts.
In 100 parts of solid matter:

Organic matters	Urea	33.00
	Uric acid	.86
	Alcoholic extract	29.03
	Aqueous extract	5.80
	Mucus from bladder	.37
Fixed salts	Sodium chloride	16.73
	Phosphoric pentoxide	4.91
	Sulphuric trioxide	3.94
	Lime	.49
	Magnesia	.28
	Potash	4.47
	Soda	.12

About 2½ pints is the usual amount secreted in twenty-four hours. The quantity is increased by much drinking, cold, exercise, excitement, and in such diseases as diabetes. A diminished flow follows fever, sweating, and thirst, and occurs in chronic Bright's disease. In diabetes a large amount of grape sugar (glucose) is contained in the urine, owing to an incomplete digestion of the food, sometimes in the proportion of over a pound in the liquid voided during twenty-four hours. Small amounts of glucose occasionally appear in the urine in health. In albuminuria a large quantity of albumin is secreted, the formation of which is due to a lack of secretive power on the part of the kidneys.

Ur'sa Ma'jor (Latin, literally, "Greater Bear"), the first of Ptolemy's N. constellations, including the fine group of seven stars known as Charles's Wain, the Dipper, or the



URSA MAJOR AND POLARIS.

Butcher's Cleaver, near the N. pole, formerly called also *Septentriones* (likewise *Septemptriones*) and the Plow.

Ursa Mi'nor (Latin, literally, "Lesser Bear"), one of Ptolemy's N. constellations, containing the N. Star (*Polaris*) and the group anciently known as Cynosura, the Dog's Tail. Polaris is a star of the second magnitude. About 15° from it is another equal star, β Ursæ Minoris. In the latitude of the N. U. S. neither of these stars ever sets.

Ur'sidæ. See Bears.

Ur'sulines, an order of celibate women in the Roman Catholic Church, named in honor of St. Ursula, who, according to legend, suffered martyrdom in the third, fourth, or fifth century, being massacred, together with her army of 11,000 virgins, by the Huns near Cologne. The order was founded by St. Angela Merici of Brescia, who in 1537 became its first superior. St. Charles Borromeo was a powerful friend of the Ursulines. They have houses in various countries, and are chiefly devoted to the training of girls. In 1906 there were twenty-seven Ursuline conventa in the U. S., with over 1,000 nuns.

Urtica'ria. See Nettle Rash.

Uruguay (Spanish pron., ô-rô-gwī'), officially República Oriental del Uruguay, formerly Cisplatine Republic or Estado Oriental, the smallest of the S. American republics; in the SE. of the continent and entirely in the S. temperate zone; bounded N. by Brazil, E. by the Atlantic and Brazil, S. by the Rio de la Plata, and W. by the Uruguay River, separating it from the Argentine Republic; area, 72,170 sq. m.; capital, Montevideo with a pop. (1908) of 316,000.

The general surface is rolling or hilly, with many ridges. Bordering the Uruguay there are fertile plains resembling the pampas of the Argentine, and near the Atlantic are extensive swamps and lagoons, separated from the ocean by wide sand dunes. Most of the land is open prairie; the largest forests are in the W. part. Besides the Uruguay and Plata, the only important river is the Negro, which flows to the Uruguay, and is navigable in its lower course. Lake Miri, on the NE. frontier, is entirely included in Brazil, but furnishes an outlet to the N. for the Uruguayan territory bordering on it. Uruguay has no good natural harbors. The best is that of Montevideo, on the Plata. Maldonado, at the extreme SE. angle of the coast, is much used for a shelter during storms. The climate is temperate and healthful; the winter months (May to October) are marked by a lower but not unpleasantly cold temperature, with occasional light snows and severe southerly storms called *pamperos*; rains are abundant almost all the year.

Gold is washed on a small scale; there are fine marbles, agates, and fossil woods. Other minerals, including coal, are reported. The soil in many places is very fertile; wheat and fruits (apples, pears, quinces, etc.) are extensively grown. The leading industry is stock raising, for which the land is especially adapted. In 1902 there were 7,029,078 cattle, 659,726 horses, and 17,927,071 sheep. Much of the land is held in large estates on which the cattle run almost wild; nearly all the small land holdings are in the agricultural districts settled by recent immigrants. Subsidiary to the grazing industry are many *saladeros*, where jerked beef is prepared, one or two condensed-meat factories, and a few tanneries. The common roads are generally bad, and in some of the more remote districts traveling is still dangerous, owing to brigands. Uruguay has now several railways, most of them radiating from Montevideo, and one crossing the country to the Brazilian frontier; in 1906 the aggregate length open for traffic was 1,217 m., all in British hands. There is a fairly good interior system of telegraphs and cable communication with Europe and the U. S.

Commerce is active, the exports exceeding $33,000,000, and the imports $34,000,000, in 1906. Nearly all of this is carried on foreign vessels. The principal exports are wool, hides, bone ash, tallow; frozen, salted, and condensed meats; wheat and fruits. The trade is mainly with Great Britain (about one third), France, Belgium, and Brazil. The imports from the U. S. were valued in 1896 at $3,358,379, but have since fallen off; the exports to that country reach about $2,000,000 annually. The standard of value is the *peso fuerte* or dollar ($1.034 in U. S. currency); no gold and little silver are coined, but gold coins of other countries circulate freely.

In 1908 the population was estimated at 1,111,758. The native population embraces a small educated and wealthy class, but the great mass, especially in the grazing districts, is of the mixed race called Gauchos; owing to their roving and turbulent disposition these people readily follow any revolutionary leader. A steady stream of immigration, mainly from Italy, Spain, and Brazil, has added a laborious and useful class to the population. Commerce is almost entirely controlled by foreign merchants. All the culture and much of the wealth are gathered at Montevideo, the capital and only large city. In the frequent civil wars Montevideo has generally been held by one party and the interior by the other.

Uruguay is a centralized or unitarian republic, divided into nineteen departments. Congress consists of two houses; these, in joint session, elect the president for a term of four years, and he is ineligible for reëlection during the two following terms. The established religion is the Roman Catholic, but the church receives only a small subvention, and all sects are tolerated. Primary education is compulsory; Montevideo has a national university, school of arts and trades, museum, etc. The army, on a peace footing, consists of 3,500 men, and the navy is insignificant. The finances are in bad condition, the revenue (mainly derived from customs duties) being constantly less than the expenditure if the service of the debt is included. By an arrangement with bondholders, made in 1892, the interest on the foreign debt was reduced one half.

Of all the S. American countries Uruguay was the last settled by Europeans. This was partly owing to the fierce character of the Charruas and other Indian tribes near the coast, though the interior was inhabited by the pacific Guaranys. In 1624 the mission of Santo Domingo de Soriano was founded on the Rio Negro. Portugal claimed all the land N. of the Plata, and in 1680 established Colonia de Sacramento, a fortified post, nearly opposite Buenos Ayres; this was repeatedly besieged, and was alternately held by the Portuguese and Spanish until its final cession to the latter in 1778. Portuguese who had fortified the bay of Montevideo were driven out in 1726, and the city was founded soon after. It became the capital of the country and the residence of governors who, after 1776, were subordinate to the viceroy at Buenos Ayres; in 1807 the city was taken by the British, but it was soon evacuated. The revolution of 1810 in Buenos Ayres quickly spread to the *gauchos* of Uruguay, but a strong Spanish force held Montevideo until 1814. The country remained in a disordered state under the irresponsible government of Artigas, a *gaucho* leader. After a desultory war of several years, Artigas was driven out, and Uruguay was annexed to Brazil as the Cisplatine state (later, when Brazil became independent, the Cisplatine province). Revolts, encouraged by Buenos Ayres, broke out in 1825, and were finally successful in 1828, when both Brazil and Buenos Ayres recognized the independence of Uruguay. The political parties, *Blancos* and *Colorados*, speedily plunged the republic into fresh civil wars. Rosas, dictator of Buenos Ayres from 1835, wished to extend his power into Uruguay. He therefore espoused the cause of Oribe, the revolted chief of the Blancos, who, thus aided, held most of the interior from 1842 to 1851, besieging Montevideo at intervals; this period is known as the Nine Years' Siege. Brazil and Entre Rios at length interfered. Oribe was forced to capitulate in 1851, and Rosas was overthrown soon after. In 1862, the Blancos being in power, ex-President Flores led a revolt of the Colorados, and was eventually supported by Brazil. Thus aided, Flores took Montevideo, and became president in 1865. Lopez, dictator of Paraguay, made this affair the pretext for a war on Brazil, in which Uruguay and Argentina engaged as allies of the latter country. This war, one of the most bloody ever known in S. America, was ended by the death of Lopez in 1870. From that year until 1876 Uruguay had several civil wars. Since then the country has been comparatively quiet and prosperous, and it is probable that the extension of railways will furnish a check to the dangerous *gaucho* class. In 1890-91 there was a sharp financial crisis.

Uruguay, a river of S. America; rises on the W. slope of the Brazilian Coast Range; flows W., then SW. between Rio Grande do Sul and the Argentine Republic, and finally S. between Uruguay and Argentina, and empties into the Rio de la Plata, which is the estuary of the Paraná and Uruguay combined. The upper portion is called the Pelotas. As a means of communication the Uruguay is important, though inferior to the Paraná. Large steamers ascend to Paysandú, in Uruguay, about 150 m. from the Plata, and small ones to Salto, 50 m. farther. Whole length of the Uruguay and Pelotas, over 1,100 m. Toward the mouth the river is 7 or 8 m. wide, but divided by islands.

Usage (ūz'āj), the habitual practice of a person, a class, a trade, or a community. The term is used often interchangeably with custom. Strictly speaking, however, custom is a usage which has acquired the force of law. For example, the custom of merchants allowing days of grace on a bill of exchange or promissory note was long part of English common law. A custom need not be proved; judges will take judicial cognizance of it, and contracting parties cannot plead ignorance of it. On the other hand, a usage must be proved by the party whose case depends upon its existence. It may be established by the evidence of one witness if his means of knowledge and his credibility are satisfied.

Us'begs. See UZBEGS.

U'ses, in law, rights, recognized only in equity, to the possession and enjoyment of real estate, the legal title to which is vested in another. At an early day the English ecclesiastics, in order to avoid the statutes of mortmain, which forbade them to take or hold lands in England, contrived a plan whereby they might enjoy all the benefits of ownership without taking or holding the forbidden title. The land was conveyed by the donor to some person in the ordinary manner, but the conveyance was accompanied with the direction—which might be contained in the deed, or which might be a mere oral declaration of intention—that the grantee should hold the land to the use, or to the benefit, of a designated person or corporation. As this method enabled the person or corporation to avoid the feudal burdens, it became very popular till it was checked by the statute of uses (1535), but thereafter two transfers were made, the statute affecting only the first; and the second was protected by the courts of equity, and developed the modern method of TRUSTS (*q.v.*).

Ussh'er, or Usher, James, 1580-1656; prelate of Irish Protestant Church; b. Dublin; took orders in the Church of England, 1601; drew up the Articles of Faith of the Irish Church, 1615; became bishop, 1620; archbishop, 1624-25; had his house destroyed by the Irish rebels, 1641, while visiting England, and remained there; twice elected by the Long Parliament to the Westminster Assembly of Divines, but from loyalty to the king did not attend. He prepared the Irish Articles of Religion (1645), and proposed a system of reduced episcopacy as a compromise between Episcopalians and Presbyterians. Died in England, and by order of Cromwell was buried with great magnificence in Westminster Abbey. He was the author of numerous theological treatises, mostly in Latin. His most notable work is "Annales Veteris et Novi Testamenti" (1654), a proposed scheme of biblical chronology, at first accepted, but since disproved by recent investigations.

Usury (ū'zhū-rĭ). "When money is lent on a contract to receive not only the principal sum again, but also an increase by way of compensation for the use," the increase "is called interest by those who think it lawful, and usury by those who do not so" (Blackstone's "Commentaries," 2, 454). The term is now applied to the taking of an illegal rate of interest. Most of the states prescribe a lawful rate of interest, and subject the taker of any excess to punishment as a criminal, as well as to the forfeiture of a part or the whole of the principal and lawful interest. In order to have a case of usury there must be a loan or forbearance of money. Hence one who buys negotiable instruments, bonds, or mortgages for less than their face value does not engage in a usurious transaction. In many jurisdictions, however, it is held that the buyer of accommodation paper is a mere lender of money, and hence if he pays less than the face and legal discount the transaction is usurious. Corrupt intention is essential to usury. From this it follows, on the one hand, that whatever may be the form of the transaction, however cunning may be the devices for evading the statute, if the parties have in effect bargained for the loan or forbearance of money at a prohibited rate of interest, the transaction is under statutory ban; on the other hand, if an illegal rate of interest is agreed upon or paid by mutual mistake, the statute is not violated, but the mistake may be corrected and the agreement really intended by the parties enforced.

U'tah (the SALT LAKE STATE), one of the states of the U. S. of N. America; organized as a territory in 1850; admitted as a state in 1896; the thirty-second admitted to the Union. Capital, Salt Lake City, with pop. (1910) 100,000.

It is bounded N. by Idaho and Wyoming, E. by Wyoming and Colorado, S. by Arizona, and W. by Nevada. Greatest length, about 350 m.; greatest width, nearly 300 m.; area, 84,928 sq. m. of which 2,601 sq. m. are water surface.

Utah is traversed N. and S. by one great range of mountains, the Wasatch, and there are several minor ranges, as the Deep Creek, Oquirrh, and San Francisco in the W., and the Roan or Book, the La Salle, the Sierra Abajo, and the Orejas del Oso in the E. and SE., with the same general direction. There is also one great transverse range running E. from the Wasatch to the Rockies, along the NE. boundary. E. of the Wasatch Range the water flows into the Du Chesne, Green, Uinta, Price, Grand, White, Dirty Devil, San Juan, and San Rafael rivers, reaching the Pacific through the Colorado River and Gulf of California. W. of the Wasatch Mountains the waters, for the most part, flow into the Great Salt Lake. The Wasatch and Uinta mountains are high and rocky, broken and furrowed into cañons and deep gorges. Some of their peaks reach 14,000 ft. The only rivers of importance within Utah are the Green and the Grand, forming the Colorado. The others are little more than mountain streams. The rivers have formed deep cañons or ravines, ranging in depth from 500 to 4,000 ft., the stream at many places being inaccessible. E. of the Wasatch Range the country is broken and rough, consisting of mountain spurs, high plateaus, and arid mesas, the soil being hard and clayey and generally weak. W. of the Wasatch there is a succession of valleys, extending N. and S. These vary in length from 1 to 40 m., and in width from 1 to 15 or 18 m. The valleys and mesas range in elevation from 4,000 to 7,000 ft. W. of the GREAT SALT LAKE (*q.v.*) is a vast alkaline desert, 100 m. in length and 40 m. in width.

In the main the soil is arid and much of it alkaline, some sections being so strongly impregnated with the salts as to render its reclamation impracticable. The soil of the valleys is sedimentary, gravely, clayey, and sandy; that of the mesas is hard clay or rocky. However, the land is not, as a rule, difficult of reclamation where water for irrigation can be obtained, and with sufficient water the soil is extremely fertile. Agriculture is dependent upon artificial irrigation, the rainfall being slight and uncertain. Weeks and sometimes months pass without a shower. The result has been the development of an extensive system of reservoirs, canals, and ditches for irrigation purposes. The chief agricultural products are, in the order of their value, hay, wheat, oats, potatoes, barley, corn, and rye; of fruits, there are apples, peaches, plums, apricots, cherries, grapes, etc. Dried fruits are shipped to the E. In 27 counties there were (1906) 21,800 farms with a total area of 1,790,700 acres, of which 700,396 acres were under cultivation. In 1908 the live stock consisted of 122,000 horses and mules, 79,000 milch cows, 324,000 other cattle and 2,967,000 sheep. The yearly wool clip (1907) yielded 4,865,875 lb. of scoured wool, valued at $3,162,819.

THE GREAT SEAL OF THE STATE OF UTAH
INDUSTRY
1847
1896

Next to agriculture the chief industry is mining. Gold, silver, lead, copper, iron, and zinc ores exist in large quantities, and extensive measures of coal are found. Silver is found in nearly all the mountains from one end of Utah to the other, and the state ranks third in the silver production of the U. S. A superior onyx has been found on the W. shore of Utah Lake. There are beds of sulphur, among the largest in the world; alum, borax, gypsum, rock salt, and asphaltum, the last mentioned being used largely for paving streets in Salt Lake City. Salt is obtained by evaporating the briny water of Salt Lake.

The climate is mild and equable in the valleys, but extremely cold in the winter in the mountains. In the S. the snowfall is light. Principal cities and towns are Salt Lake City, Ogden, Provo City, Logan, Park City, Springville, Eureka, Brigham, Spanish Fork, American Fork, and Payson. The population in 1910 was 360,000. Manufactures were early stimulated by the necessities of the people, owing to the distance from manufacturing centers and the cost of transporting goods by teams from the Missouri River. The U. S. census of 1900 shows that 1,400 manufacturing establishments were in operation. Large beet-sugar factories are in successful operation at Lehi, Ogden, Logan, and Garland. There are many smelters, reduction mills, and refineries.

The majority of the people are Mormons; or Latter-day Saints. They own numerous and many of them large, costly, and imposing edifices called temples, tabernacles, stake houses, chapels, and meetinghouses. The temples, of which there are four magnificent structures—*viz.*, at Salt Lake City, Logan, Manti, and St. George—are not used for public services, but in them are performed the secret rites of the Church. None but members are permitted to enter. The tabernacles and other church buildings number about 200, with a seating capacity of 75,000, and are for public worship. Utah has an excellent system of free schools, supported by general and local taxation, and good schools are maintained for nine or ten months of the year. The Univ. of Utah, at Salt Lake City, is supported from the state treasury, and the Agricultural College, at Logan, is supported by the state and by the U. S. The government of the state is that provided in the constitutional convention held at Salt Lake, May 4–6, 1895, as amended in 1900. The legislative branch consists of a senate and a house of representatives, both chosen for two years, and holding sessions biennially. They are all chosen by popular vote, men and women over twenty-one having equal electoral rights. Education is free and unsectarian and open to all. Polygamous or plural marriages are prohibited, but absolute freedom of conscience is guaranteed. The public debt must not exceed $200,000 over and above the territorial indebtedness assumed by the state. Coronado's expedition visited the region in 1540; but the Great Salt Lake was not discovered till 1824, and soon thereafter trading posts sprang up about it. Utah was settled by the Mormons in 1847, when it was Mexican territory. Owing to the impossibility of living at peace in Missouri and Illinois, Brigham Young, the president of the church, led his people W. into the wilderness, the first band, numbering 143, arriving in the Salt Lake valley July 24, 1847. In 1848, by the Treaty of Guadalupe Hidalgo, the land was ceded to the U. S. Since then Utah has been the headquarters of the Mormons. For two years there was no secular government. In 1849 a constitution was formulated and the provisional government of the State of Deseret went into operation. In 1850 Utah was organized into a territory of the U. S., but the new government did not go into effect until 1851. In 1857 the U. S. Govt. sent an army into Utah, it being alleged that the Mormon leaders were preventing immigration, exercising power and authority unlawfully, and interfering with the Federal courts. The Mormon militia was mobilized and, opposing the army on the E. border, prevented the troops from reaching Salt Lake valley until 1858. There was no actual collision between the opposing forces, but the militia burned some supply trains and annoyed the troops so as to prevent an advance beyond Fort Bridger. In 1862 Congress passed a bill to punish those guilty of polygamy, yet for years little effort was made to enforce the law. In 1882 another and more drastic act was passed, and in 1887 Congress passed a bill greatly restricting suffrage and escheating most of the vast property of the Mormon Church. The act of 1882 was the work of Senator George F. Edmunds, and was upheld by the Supreme Court. From 1885 to 1890 there was persistent warfare against the polygamists in the courts, and in October, 1890, after more than 1,100 of their men had served terms in the penitentiary, the people voted to sustain the proclamation or "manifesto" issued by their president, discontinuing polygamy. But it was developed in 1905–6, in the inquiry into the eligibility of Senator Reed Smoot by the U. S. Senate, that Mormon practices still persist. In 1905 6,500 claims were thrown open in the Uinta Indian Reservation.

Utah Lake, the largest body of fresh water in Utah; N. lat. 40° 15′, W. lon. (from Greenwich) 111° 45′. Its altitude above the sea is 4,500 ft.; its length from N. to S. is 25 m.; its extreme width, 13 m.; its area, 150 sq. m. The valley in which it lies is part of a great trough formed by the uplift of the Wasatch range of mountains at the E. and the Oquirrh, Lake, and Tintic ranges at the W. The E. range is the loftier, and all the tributaries of the lake come from that side. Corn Creek, Hobble Creek, and the American Fork rise in the Wasatch Mountains, but the Spanish Fork and Provo River head to the E. of the range and pass through it in deep defiles. Its outlet is the river Jordan. The water contains .00030 of mineral matter, of which .00018 is calcium sulphate.

Ute (ūt) **In'dians.** See SHOSHONEAN INDIANS.

U'tica, ancient city of Africa; on the river Bagradas, near its entrance into the Mediterranean, occupying the site of the modern village of Duar or Bon-Shater. When Carthage was destroyed Utica rose in importance and became the capital of the Roman province. Here the last stand was made by the Pompeian party against Cæsar, and here, too, was the scene of the suicide of the younger Cato. The remains of its temples, amphitheater, and aqueduct show that it must have been a magnificent place. In the seventh century it was taken and destroyed by the Arabs.

Utica, capital of Oneida Co., N. Y.; on the Mohawk River; 53 m. E. of Syracuse and 96 m. W. of Albany. It is built on the slope of a hill, about 500 ft. above sea level, and has thirteen public squares and parks. The surrounding country is devoted principally to dairying. General agriculture and the cultivation of roses are carried on. The city is the chief cheese market in central New York. The public buildings include a U. S. Govt. building, City Hall, a state armory, public library, and Young Men's Christian Association building. Forest Hill Cemetery is a place of much artistic beauty.

The estimated value of the church property in Utica is over $1,500,000. The school system includes ward schools, a training school, an academy for higher education, and many private schools. The charitable institutions include the State, City, St. Luke's, Homœopathic, and Faxton hospitals, Home for the Homeless, Home for the Aged, Utica Orphan Asylum, St. Vincent's Protectory, and a Masonic home. The benevolent institutions have real estate valued at over $1,500,000. Utica is known as the "City of Charities."

The census returns of 1900 showed 733 manufacturing establishments in Utica, representing 106 industries, among them the manufacture of men's clothing, hosiery, and print goods, steam fittings and heating apparatus, foundry and machine-shop products, $811,577, and cotton goods. The cotton and woolen mills in the city use upward of 40,000 bales of cotton annually. The annual output of beer is over 94,000 bbls. Other manufactures are canned goods, furnaces, iron pipe, furniture, agricultural implements, steam gauges, oilcloth, varnish, hosiery, trunks, and gas fixtures. The site of the city was known in early days as Old Fort Schuyler, from the blockhouse erected at the fording place over the Mohawk River, near the present intersection of Second Street and the railway. The site was taken from a tract of 22,000 acres given by the king to William Crosby, the colonial governor, in 1734, which became known as Crosby's Manor. The place was settled by immigrants from England and New England; incorporated as a village, April 3, 1798, and chartered as a city, February 13, 1832. Pop. (1910) 75,000.

Utilita'rianism, the doctrine that the object of all moral conduct is to subserve utility. The theory has played historically a great rôle in the development of ethical thought. It began in the Greek moralists, who identified the supreme good—the *Summum Bonum*—with happiness. In modern times the home of utilitarianism has been England, where the school of English utilitarians has pressed the theory with great force and refined it with great ingenuity. The British development may be said to have begun with Locke, and continued by Hobbes, Hume, James Mill, John Stuart Mill, Bentham, Bain, Spencer, Stephen, and Sidgwick. The doctrine itself has passed through several interesting phases, all inspired by the criticism of the intuitional moralists, who argued that the most conspicuous thing about moral conduct is just the fact that it is disinterested—*i.e.*, not done with view to utility. The postulate of "general utility," or "the greatest good of the greatest number," came to be substituted for the happiness of the private individual; and in this way Bentham and James Mill sought to do justice to the demand that morality should have an altruistic ingredient. The point is made in opposition to such a statement of the ethical end that there is no way of telling what the greatest happiness of the greatest number is except by judging of the happiness of the individual. Another attempt to put utilitarianism above the criticism of being egoistic is that of John Stuart Mill, who distinguished between the lower or more physical enjoyments to which the word "pleasure" applies and the higher or more spiritual to which the word "happiness" should be restricted. It is in recognition, in the main, of this distinction that the school of utilitarian thinkers is divided into two wings—*i.e.*, the Hedonists, or lower-pleasure men, and the higher-pleasure men, called Eudæmonists.

Uto'pia, an imaginary island, the abode of a people free from care, folly, and the common miseries of life, described by Sir Thomas More in his political romance "De Optimo Reipublicæ Statu, deque Nova Insula Utopia" (1516). The term utopian is applied to impossible ideal schemes.

Utraquists (ū'trā-kwĭsts), a Hussite sect, deriving their name from the fact that they demanded the Lord's Supper administered to them *sub utraque specie*—that is, in both bread and wine. They were also called Calixtines from *calix*, chalice. The execution of Huss at Constance created an immense excitement in Bohemia, and brought about a complete breach between his adherents and the Church of Rome. In the so-called Four Articles of Prague the Utraquists set forth their demands—freedom of preaching, communion under both kinds, the reduction of the clergy to apostolic poverty, and severe punishment of all open sins. The war was bloody, but successful; and it was simply the internal split in the Utraquist party which finally gave the victory to the Romanists. By the compacts of Iglau the pope yielded only the one point of the Prague articles—communion under both kinds.

Utrecht (ū'trĕkt), capital of the province of Utrecht, Holland; on the Old Rhine, where the Vecht branches off from it, 23 m. SSE. of Amsterdam. It is a railroad center of Holland. It is fortified, well built, traversed by canals, and surrounded with fine promenades, has two cathedrals, and, among other educational institutions, a celebrated university, founded in 1634, with which are connected museums and scientific collections. Its manufactures of plush, velvet, and carpets, of leather, soap, salt, and brandy, of metal ware and cigars are very extensive, and it carries on trade in grain, cattle, and its own goods. It is probably the oldest town of the Netherlands, called by the Romans *Trajectum ad Rhenum* or *Ultrajectum*, from which latter appellation its present name is derived. Here the fusion between the seven provinces which formed the

Dutch Republic was organized in 1579 to withstand the tyranny of Spain, and here the treaty was signed (April 11, 1713) between France, England, Holland, Prussia, Portugal, and Savoy which ended the War of the Spanish Succession. Pop. (1907) 114,692.

Utrecht, Peace of, a treaty, or treaties, of peace concluded (1713), after the ten years' War of the Spanish Succession, between France and the allied powers—Great Britain, Holland, Prussia, and Savoy and Portugal—and acceded to by Spain. It confirmed Philip V of Bourbon as King of Spain, the crowns of France and Spain never to be united; recognized Prussia as a kingdom and accorded her Neuchâtel and part of Gelderland on her renunciation of all claim to Orange; gave to Great Britain New Foundland, Nova Scotia, Gibraltar, and Minorca, with the right to send African slaves to America; to Austria, the Spanish Netherlands, Sardinia, the Milanese, and Naples, and to Portugal additions in S. America. Savoy received Sicily from Spain; Holland was secured by the Barrier Treaty, and France recognized the Protestant Succession in England.

Uz'begs, or **Uzbecks,** a people of mixed Turkish blood inhabiting Turkestan, where they are the dominant race, though now subject to Russia. Intellectually and morally they are the superiors of those about them. They are zealous Mohammedans, and pride themselves on their culture and civilization. In 1862 the Chinese Uzbegs revolted from China, and under Yakub Beg founded a Mohammedan empire, with 1,000,000 inhabitants and 740,000 sq. m. of territory. At his death, in 1877, his empire became subject to China.

V

V, the twenty-second letter of the English alphabet. The forms V and U until the seventeenth century were used interchangeably as signs for both *u* and *v*, and are merely two forms of the original Roman V (see U), which had a consonant value (= *w* in *weal*), as well as a vowel value (= *u* in *rule*). Only the addition of voice distinguishes it from the sound of *f*. See ABBREVIATIONS.

Va'ca, Alvar Nuñez Cabeza de, 1507-64; Spanish explorer; b. Estremadura, Spain; went to Florida in 1527 in the expedition of Pánfilo de Narvaez, and, after an unsuccessful land journey, again took ship, sailed along the N. coast of the Gulf, and was cast ashore at Matagorda Bay. After six years of captivity among the Indians, he met three other survivors of the expedition, with whom he journeyed westward, and followed the course of a large river, probably the Rio Grande, until he fell in with some Spanish explorers on the river Petatlan, and was conducted to a town in Sinaloa. Authorities disagree as to the route taken by the four travelers, some holding that it lay through New Mexico, others tracing it through S. Texas, Chihuahua, and Sonora. Some identify a large stream crossed by De Vaca on his westward journey with the Mississippi, and give the credit of its discovery to him instead of De Soto. The Kingdom of Cibola, the country of the civilized Pueblos, is thought to have been first visited by De Vaca and his men. De Vaca returned to Spain in 1537, but was soon afterwards appointed administrator of La Plata and went to Paraguay, of which country he was the first explorer. Arrested in 1544 on the charge of one of his subordinates, he was sent to Spain and condemned to exile in Africa. He was pardoned after eight years, and lived at Seville till his death. De Vaca published an account of his adventures in 1542.

Vaccination (văk-sĭ-nā'shŭn), (1) in a narrow sense, the inoculation of an individual with the virus of cowpox, to confer protection against smallpox; (2) in a broader sense, inoculation with any mild virus to produce protection against malignant disease. The former use of the term is the common one. It was observed that on the udders of cows an eruption was seen which infected the hands of the milkers. Pustules were produced on the hands, and sometimes changed into painful sores; other parts of the body became affected, and sometimes there was extensive disturbance of the general system. The remarkable fact was discovered that persons who had passed through this disease were protected from smallpox. In Scotland, England, and Holstein in the eighteenth century inoculations were made with the contents of the pustules from the udders of cows. In 1781 a milkmaid who had the cowpox went to London, and there attempts were made to inoculate her with smallpox, but without success. In the medical circles of the metropolis this did not excite much attention, and it remained for Edward Jenner to see its scientific importance and to make it useful to mankind. Jenner inoculated people who had gone through with the cowpox with the virus of smallpox, and in all cases without result. Many of the persons inoculated had had the cowpox many years before, one of them fifty-three years before. In 1801, 10,000 persons were vaccinated by him and other physicians in England, and on more than half of them experiments were tried which proved that the method was entirely successful as a preventive of smallpox.

In 1857 the British Parliament received answers from 542 physicians to questions which were asked them in reference to the utility of vaccination, and only two of these spoke against it. Nothing proves this utility more clearly than the statistics obtained. Especially instructive are those which Flinzer compiled respecting the epidemic in Chemnitz which prevailed in 1870-71. At this time in the town there were 64,255 inhabitants, of whom 53,891, or 83.87 per cent, were vaccinated; 5,712, or 8.89 per cent, were unvaccinated, and 4,652, or 7.24 per cent, had had the smallpox before. Of those vaccinated, 953, or 1.77 per cent, became affected with smallpox, and of the uninoculated, 2,643, or 46.3 per cent, had the disease. In the vaccinated the mortality from the disease was 0.73 per cent, and in the unprotected it was 9.16 per cent. In general, the danger of infection is six times as great, and the mortality sixty-eight times as great, in the unvaccinated as in the vaccinated. In general the period of protection lasts about ten years.

The method ordinarily used in procuring the lymph is to inoculate young heifers with the virus of cowpox, and, when the vesicles are fully formed and before the stage of pustule formation is reached, incisions are made in the vesicles and small ivory points are dipped into the fluid, or it may be drawn up in capillary tubes. When ivory points are used the lymph on them is allowed to dry, and they may then be kept for an almost indefinite time. In performing the operation the skin on the spot selected, usually the shoulder or upper part of the arm, should be carefully cleansed, and then with a perfectly clean instrument the skin should be gently scraped off over a small space, which need not be larger than an eighth of an inch square. As soon as the moist deeper layers of the skin are reached the ivory point containing the virus should be rubbed over the spot, and the small wound allowed to dry. On the third day a little lump develops; on the fifth day this begins to form a blister, and on the seventh day it is ripe, with a red edge and a yellow or brownish center. The blister then breaks, and a brown scab forms which in three or four weeks falls off, leaving a scar. When animal lymph is used and the operation is performed by a competent physician with due regard to cleanliness and proper treatment of the wound, the liability to inoculation with other diseases is so slight that it may be ignored.

Notwithstanding the evidence from all sides as to the efficacy of vaccination as a protection from smallpox, there have not been wanting opponents to the procedure. It is impossible for anyone with any acquaintance at all with the nature of the evidence, and with any appreciation of the value of evidence generally, to see on what grounds the position of these enemies to society is based. See the article Immune in regard to the way in which immunity by vaccination and inoculation is produced. See Virus.

Vacuum (văk'ū-ŭm), a void; a portion of space which contains no matter. The definition implies a condition which it is impracticable to fulfill altogether, but the physicist is able to approach almost indefinitely near to the fulfillment. The ordinary mechanical air pumps cease working before the pressure is reduced to $\frac{1}{1000}$ of an atmosphere, but by means of mercury vacuum pumps it is possible, as is explained in the article Pneumatics, to obtain an exhaustion of $\frac{1}{1000000}$. By the addition of chemical and other processes for getting rid of the traces of vapor which remain, even after the action of the mercury pump has reached its limit, it is possible to attain to still higher degrees of exhaustion. Thus Crookes, Rood, Bidwell, and others describe vacua of from $\frac{1}{100000000}$ to $\frac{1}{2000000000}$ of an atmosphere. The properties of gases at such low pressures are of great interest. A high vacuum is, for example, the best of insulators against the passage of heat. Dewar made use of this property in preparing a vial of liquid oxygen for transportation. The liquid, which boils at − 196° C., was placed in a double flask. The inner vial was coated with a mirroring surface of mercury (frozen) to protect the contents from radiation. Between the walls of the inner and outer flasks the pressure was reduced to a very small quantity. In this manner, without further shield against heat conduction, the oxygen was carried with but little loss from London to Oxford, a distance of 63 m. See Barometer.

Vacuum Pan, or Vacuum Tubes. See Geissler, Heinrich.

Vagan'tes, Va'gi Schola'res, or **Go'liards,** wandering clerks of the Middle Ages. The class was a large one and contained persons of the most diverse characters—students roaming from university to university, clergy willingly or unwillingly unprovided with benefices, and even mere buffoons and popular entertainers who had happened to obtain something of Latinity at some monastic or cathedral school, and who used their uncertain connection with the Church as a means to keep them out of the hands of the secular authorities. At a very early period the obvious opportunities for abuse in such a wandering and unattached life brought upon the Vagantes the denunciations of the councils of the Church. Like the modern tramp, who is in a sense their degenerate descendant, they became the terror of the communities into which they came. The lawlessness of their lives, too often unpunished, owing to their ready assertion of their right of clergy, brought discredit upon the whole body of the latter. They seem to have grown particularly prevalent during the twelfth and thirteenth centuries, the period when the great European universities were coming into being. France and England were the countries in which they most flourished; but they were to be found in great numbers also in Germany, Italy, Spain, and even Bohemia. At last the Church became aroused, and by severe measures cut off from itself all those among the Vagantes who refused to regulate their lives. With the end of the thirteenth century they ceased to exist as a distinct clerical class.

Va'grants and Va'grancy, terms which, in their most general sense, mean "wanderers" and "wandering"; but have come to designate various classes of disorderly persons who cannot be brought within any definite classification. In all civilized countries there is more or less regulation of vagrancy by law according as the conditions giving rise to the necessity for such regulation exist or are absent. For this same reason the laws of each country must be adapted to the suppression of that species of vagrancy which is found to be most detrimental to the public welfare, so that no general classification of the laws upon this subject can be given. Thus in the U. S. the laws regulating the subject vary widely both as to the kind of vagrancy intended to be suppressed and as to the severity of punishment inflicted upon vagrants. In the U. S. the term "tramp" is in general use as equivalent to vagrant in its general sense of a wandering, disorderly person, or one wandering about without any visible means of support; but vagrant in its wider sense is applied to many classes of persons who would not be termed tramps. In England vagrancy has been a subject of regulation by law for many centuries. Generally speaking, the class of mendicant vagrants is more freely tolerated in European countries than in the U. S.

The earliest English laws made vagrancy a crime, for in 1349 and 1350, when the institution of serfdom was breaking down and a rise in laborers' wages was taking place consequent to the pestilence of the black death, the statutes of laborers (two in number) were passed to check this rise in wages, and to provide a kind of substitute for serfdom. These statutes were for two hundred years confirmed, amended, and extended or modified on several occasions.

Later, whipping, the pillory, branding, forced labor, and even slavery, were the punishments meted out to vagrants. In 1597 was passed the famous statute, 39 Eliz., c. 4, which remained in force for over a century. It provided for the erection of houses of correction for the reception of rogues, vagabonds, and sturdy beggars till either put to work or banished. In 1744 a comprehensive act was passed, which is the basis of all later laws in Great Britain on this subject. It distinguished three classes of offenders—(1) idle and disorderly persons, (2) rogues and vagabonds, and (3) incorrigible rogues.

In the U. S. vagrants were so comparatively few in numbers, and so generally harmless, that prior to the Civil War the regulation of vagrancy received but little attention. Later, however, vagrants, and especially those commonly designated as tramps, increased so largely, and became so much more dangerous, that many rural homes became unsafe, and cases of violence became not uncommon along their routes of travel.

The General Vagrancy Act of Pennsylvania passed in 1876 is typical of American legislation on the subject. It included under the title of vagrancy a large number of wandering and disorderly persons, being more general than the English vagrancy statutes; but in 1879 an act was passed distinguishing a *tramp* from a *vagrant*, as being "any person going about from place to place begging, asking, or subsisting upon charity, and for the purpose of acquiring money or a living, and who shall have no fixed place of residence or lawful occupation in the county or city in which he shall be arrested"; and by this act such persons are made liable to imprisonment, for not more than twelve months, while vagrants in general are liable only to labor for not less than thirty days and not more than six months. The constitution of California provided for the public whipping of tramps, and a determined, but unsuccessful, effort was made in Wisconsin to enact a law for the whipping of tramps.

Va'gus Nerve. See PNEUMOGASTRIC NERVE.

Vaishnavas (vĭsh'nă-văs). See VISHNU.

Valencia, or Valentia (vă-lĕn'shĭ-ă), a small island on the SW. coast of Ireland, belonging to the county of Kerry; noted as the station of the transatlantic submarine cables connecting Great Britain and Newfoundland. It is 5 m. long and 2 m. broad.

Valencia, former kingdom of Spain, bordering on the Mediterranean and between Catalonia in the N. and Murcia in the S.; is divided into the three provinces of Valencia, Alicante, and Castellon de la Plana. From the eighth to the thirteenth century it was occupied by the Moors, and from the eleventh century to 1238 it was an independent Moorish kingdom. It is the best cultivated and most productive part of Spain. Nowhere in Europe are manuring and irrigation carried to such perfection as on the terraces of Valencia, where in some places the soil yields several harvests a year. Besides the common Spanish products, the rice crop supplies all Spain; sugar also is cultivated. The country is watered by the Jucar, Requena, and Guadalaviar, and contains iron, lead, copper, cinnabar, cobalt, and coal. The lagoons on the coast, especially that of Albufera, are rich in sea fowl and fish. The inhabitants, in whom a strong mixture of Moorish blood is apparent, are industrious, and, next to Catalonia, Valencia is the chief manufacturing part of Spain. Pop. (1900) 806,556.

Valencia, capital of province of Valencia, Spain; on the Guadalaviar, near the Mediterranean; 200 m. SW. of Barcelona. The houses are neat and well built; the streets, though crooked and narrow, are clean and well paved, and in the modern quarters there are handsome thoroughfares. The city is a pleasant and enterprising place. Its cathedral, begun in 1262, is a vast edifice, containing many excellent pictures. Its university is well endowed and well attended. Its manufactures of silk, tobacco, sackcloth, and pottery are celebrated, and its export trade in grain, rice, oil, wine, almonds, figs, and oranges is large. The huerta or garden surrounding the city comprises 40 sq. m., and resembles an immense orchard, in which the citron, orange, palm, and mulberry grow luxuriantly. Pop. (1900) 213,550.

Valencia, capital of the State of Carabobo, Venezuela; in the Aragua valley, 2 m. W. of the Lake of Valencia or Tacarigua and 24 S. of its port, Puerto Cabello; 1,824 ft. above the sea; the third city of Venezuela in size, and is the commercial center of a large region, exporting cacao, coffee, sugar, hides, etc. The climate is warm (mean 77° F.). Near the city are celebrated springs in which the temperature approaches the boiling point. Valencia was founded in 1555. On the plain of Carobobo, S. of it, Bolivar gained the victories of May 28, 1814, and June 24, 1821, the latter deciding the independence of Venezuela. The first Venezuelan Congress met here after the separation from Colombia. Pop. (1894) 38,654.

Va'lens, Roman emperor of the East, 364–378 A.D.; appointed by his brother, Valentinian I. Most of the reign of Valens was devoted to the question of the E. boundary, but resulted in no definite settlement of it. In 376 the Goths, being pressed S. by the Huns, were allowed to cross the Danube with a view to settling there peaceably, but they were treated with such perfidy by the representatives of the emperor that they resorted to force. After some reverses, they defeated the Roman army, led by Valens, at Adrianople, and the emperor was never seen after the battle. The establishment of the Goths S. of the Danube marks the first decline of the Roman power. The Goths were thus permanently established S. of the Danube.

Valen'tia. See VALENCIA.

Val'entine's Day, Saint, February 14th, observed in commemoration of St. Valentinus, a martyr, decapitated in 270 A.D., during the Claudian persecution at Rome. The custom of sending valentines (sentimental or comic love messages) is very ancient. Some tell us that on this day the birds select their mates; others trace the custom to the Roman Lupercalia (February 15th), when similar practices were observed. The custom has been detected among the N. pagans of ancient Europe. Hence the true origin is probably not alone a commemoration of the loving and charitable disposition of St. Valentine.

Valentin'ian, the name of three Roman emperors. VALENTINIAN I (364–375), an officer under Julian and Jovian, had risen to a prominent position when, on the sudden death of Jovian, he was raised to the imperial dignity by the army, at Nicæa. He made his brother Valens Emperor of the East, and proceeded to Italy. He was a man of military talent, and a laborious and prudent administrator. His reign was chiefly occupied with campaigns in defense of the borders, and for a time he checked the inroads of the barbarians. His favorite residence was Treves. He was succeeded by his sons Gratian and VALENTINIAN II, an infant of four at his father's death. During his brief life the imperial power rested with Gratian, until his death (383 A.D.), and afterwards virtually in Theodosius, Emperor of the East. He died in 392 A.D. VALENTINIAN III (425–455), son of Constantius and Placidia, the sister of Honorius, was only six years old when his uncle, Theodosius II, Emperor of the East, established him as Emperor of the West. His mother, who governed in his name, was entirely under the control of the clergy, and the empire suffered severely from the rivalry between Bonifacius and Aëtius. In spite of the great military ability of the latter, who defeated Attila at Châlons in 451, the W. Roman Empire now began to crumble. Most of Africa fell to the Vandals; Britain was abandoned; Merida, in Spain, was taken by the Suevi; and along the Rhine and Danube outpost after outpost was lost. In 454 the emperor killed Aëtius with his own hand, jealous of his merits and afraid of his power. In 455 Valentinian himself was murdered by Petronius Maximus.

Valentinois (vä-läṅ-tē-nwä'), **Duch'ess of.** See DIANA DE POITIERS.

Valerian (vă-lē'rĭ-ăn), a plant the root of which is used in medicine. This plant, called also the "great wild valerian," is a native of Europe, but is cultivated also in the U. S. in Vermont, New Hampshire, and New York. It rises from 2 to 4 ft., and bears small white flowers. The root develops a strong and peculiar smell upon drying. The active principle of valerian root is a volatile oil. This is found to deaden feebly the reflex excitability of the spinal cord. Upon man, preparations of valerian sometimes reduce undue nervous irritability, and are resorted to in affections such as hysteria, chorea, and milder forms of nervousness. A curious property of valerian is the attraction of its smell for cats. These animals seem to snuff the plant from a long distance, and are said to be excited to a kind of frenzy by it.

Valet'ta, or La Valetta, capital of the island of Malta; on a rocky promontory of the NE. coast which forms two large, safe harbors. These harbors, as well as the whole city, are strongly fortified. Valetta is the station of the British fleet in the Mediterranean, and is a point of military and commercial importance, although it has no manufactures and no natural resources. It was named after its founder, Valette, Grandmaster of the Knights of St. John, who defended it against the Turks in 1565. In the cathedral and palace are monuments from the times of the Knights of St. John. Valetta also has a university and a public library, both of which were founded by the knights. Pop. (1900) 61,268.

Valhal'la, or Valhal'. See WALHALLA.

Valkyries (văl-kĕr'ēz), from the Icelandic, *Valkyrjur*—*i.e.*, choosers of the slain—maidens sent out by the god of war, Odin, to every battlefield to make choice of those who are to be slain and to turn the tide of battle. They are also called Valmaids (valmeyar). The youngest of the norns, Skuld, also rides forth to choose the slain and turn the combat. The Valkyries serve in Valhalla, where they bear the drink, take care of the drinking horns, and wait upon the table. More than a dozen Valkyries are named in the "Elder Edda." In the old sagas there are accounts of loves between Valkyries and earthly heroes, but such connections were not happy, being always followed by the premature death of the hero.

Valladolid (väl-yä-thō-lēth'), capital of the province of Valladolid, Spain; on the Pisuerga; 150 m. NW. of Madrid. It communicates by the Duero and a vast system of canals with the Atlantic and the interior. It is on a plateau, 2,100 ft. above the sea, and has a healthful and genial climate. The surrounding district is fertile. The city was from the beginning of the fifteenth century till 1560 the capital of the Spanish Empire, and had at that time over 100,000 inhabitants. It was adorned by Charles V and Philip II with magnificent buildings. The home of Cervantes and the house in which Columbus died still stand. After the removal of the royal residence to Madrid it fell into decay, and many of its buildings were damaged by the French soldiery in 1810. Its manufactures of silk, yarn, perfumery, pottery, paper, and leather have been enlarged and its trade has increased. Its university was founded in 1346. It is celebrated as a school of jurisprudence. Pop. (1900) 68,789.

Vallan'digham, Clement Laird, 1820–71; American politician; b. New Lisbon, Ohio; admitted to the bar, 1842; member of the Ohio Legislature, 1845–46; edited the Dayton *Empire,* 1847–49; member of Congress, 1857–63. He was violent in opposing the measures of the National Government in the Civil War. Failing of reëlection in 1863, he returned to Ohio, where he denounced the Government with vehemence; was arrested by order of Gen. Burnside; tried by court-martial in Cincinnati and sentenced to close confinement during the war—a sentence which Pres. Lincoln commuted to banishment beyond the lines. Dissatisfied with his reception by the Confederates, he made his way to Canada, and while there was nominated by the Democratic Party as Governor of Ohio, but was overwhelmingly defeated. He returned to Ohio, was not molested, and in 1864 was a member of the National Democratic Convention at Chicago. Accidentally shot himself while trying a murder case.

Valley, lowland partly or wholly surrounded by uplands. The term valley is sometimes used (1) broadly to include all depressions of the land surface, not excepting the narrow gorges of streams, but is more commonly restricted to (2) large depressions with bottoms of gentle slope as compared to the sides. It is also applied (3) to the catchment areas of streams, and in this sense is synonymous with basin. Under the first meaning, gorge, cañon, glen, dale, crater, etc., are varieties, and the term valley proper is used to designate the type covered by the second meaning. By the gradual washing down of slopes by rains and rivers the whole surface of the land would be reduced to a plain if there were no compensatory agencies whose work tended toward diversity of surface. The agencies which initiate diversity are of two types, both operating beneath the surface. The earth's crust is wrinkled or fractured, and thus thrown into ridges, and volcanic forces send molten rock to the surface and build up mountains and tables. The depressions between mountains thus constructed are valleys, and yet other valleys are hollowed out of uplifted plateaus by the action of water or ice. When a portion of the earth's crust having a plain surface is subjected to powerful forces acting from one side, its compression results in the production of a series of wrinkles on the surface, and the plain is replaced by a parallel system of ridges and longitudinal valleys. Valleys of this simple type exist in the Jura Mountains of Europe, but are unknown in N. America. Often the compressive forces, instead of merely bending the rocks, break them into huge blocks, which are so displaced as to produce ridges and valleys at the surface. As a rule, one or more of the valley walls is clifflike, but such original character may be destroyed by erosion. The U. S. affords many examples. The great valley of California, caused by the uplift of the Sierra Nevada at the E. and the coast ranges at the W., is 400 m. in length and 60 in width. In the region of the Desert ranges of Nevada, Arizona, and New Mexico parallel narrow mountain ridges stand 20 or 30 m. apart and divide the land into a great number of valleys. Where volcanic eruption takes place from many vents in the same district, the accumulation of the ejected material is apt to be irregular, and among its heaps valleys are sometimes inclosed. The San José valley of Costa Rica is of this type. Large craters, due either to explosion or subsidence, occasionally assume the character of valleys. The Val del Bove, on the flank of Mt. Ætna, is believed to be an explosion crater, and the Asosan valley of Japan is probably also a crater. As soon as any mountain ridge or plateau is lifted above the surrounding plain, its erosion is begun by the streams which flow from it or across it. Those streams whose original directions coincide with the slopes produced by the uplift have their grades increased, and are thus stimulated to erosive activity; they cut their channels deeper, and their courses are soon so far below the general level that they cannot easily be diverted.

If a break in the strata has produced a transverse valley—*i.e.*, one running across the direction of the general range—or if the flow of the stream is obstructed, so that erosion goes on at a high level, the result will be a narrow channel, which, if high up, is a pass, or, if on a lower level, forms a water gap. The walls of these gorges are attacked by frost and various other agencies that break up rocks, the fragments are washed into the streams and carried away, and thus the walls recede and assume gentler slopes. Most long streams traversing uplifted tracts pass from gorge to valley and from valley to gorge in alternation, each valley having its position determined in part by the stream, but chiefly by the presence of yielding rocks. The rivers of the Appalachian region have this general character, crossing sandstone and crystalline formations in narrow gorges and being bordered by valleys where the formations are of shale or limestone. Streams of ice also have power to make valleys by eroding soft rocks and leaving hard, but it is not easy to discover one which they have initiated. The valleys in which ice work is recognized were temporarily occupied by glaciers in the Pleistocene period, but most or all of them had been previously occupied by rivers. Nevertheless the mountain glaciers were important valley makers, for they broadened the bottoms of their channels and thus converted gorges into valleys. Yosemite, the mountain valleys of Tuolumne, Kern, and King rivers of California, and the Scottish glens were thus transformed by glacial erosion.

Valley Forge, village, Schuylkill township, Chester Co., Pa.; on the Schuylkill River; 24

m. W. of Philadelphia. It was here that the American army under Washington encamped from the middle of December, 1777, till June 18, 1778, when it started in pursuit of the British across New Jersey. Washington selected the place for winter quarters to protect the Congress, which, on the occupation of Philadelphia by the British, had adjourned from that city to York. Here also Baron Steuben assumed the office of Inspector General of the army, and Washington announced, May 6, 1778, the treaty of alliance with France. The American troops numbered about 11,000, of whom only about one half were fit for active service, and all suffered severely from cold and hunger.

Vallombro'sa, former Benedictine convent, 16 m. ESE. of Florence; surrounded by dense woodlands. It was suppressed, 1869, and the buildings are now used as a school of forestry.

Valmy (vä̆l-mē'), **François Christophe Kellermann** (Duke of), 1735–1820; French general; b. near Rothenburg, Bavaria; served in the Seven Years' War. In 1791 he became general of the army of Alsace, and in 1792 commanded the army of the Moselle. After joining Dumouriez he gave battle to the allies at Valmy (September 20th), where he gained one of the most important victories of this period. It secured France from invasion, and enabled the convention to go on with its radical measures. Kellermann, being a moderate republican, was arrested in 1793 on suspicion, and remained in prison until 1794. After the first Italian campaign was well under way (1795), the Directory purposed to send Kellermann to share with Napoleon the responsibilities, but the latter refused to go, saying that one bad general was better than two good ones. In 1804 Napoleon made him Duke of Valmy, but in 1814 Kellermann voted for his deposition, and supported the restored Bourbons, who confirmed his title, and made him a peer. His son, FRANÇOIS ÉTIENNE KELLERMANN, Duke of Valmy (1770–1835), is noted especially for his brilliant cavalry charge at Marengo in 1800. He also distinguished himself at Austerlitz and in the Waterloo campaign.

Valois (vä̆l-wä̆'), the name of a dynasty of France (1328–1589), so called from the ancient county of Valois, now part of the departments of Oise and Aisne. In 1285, Philip III gave the county of Valois to his younger son, Charles (b. 1270; d. 1325), and when the direct line of the Capetian dynasty died out in 1328 with Charles IV, the eldest son of this Charles of Valois ascended the French throne under the name of Philip VI, and founded the dynasty of Valois, which ruled till Henry III (1574–89), with whom all the male lines of the house of Valois died out, and the French crown fell to the house of Bourbon, descending from Robert, the younger brother of Philip III, and represented by Henry IV, King of Navarre. The most prominent events during the reign of the house of Valois were the Hundred Years' War with England, the wars of conquest in Italy, and finally the civil or religious wars.

Valparaiso (vä̆l-pä̆-rī'sō), city and port of Chile, and the most important seaport of the Pacific coast of S. America; on a bay, 68 m. WNW. of Santiago. The harbor is commodious, but it is open to northerly storms. Originally, the town was on a strip of flat land fronting the water, and now occupied by the business portions; beyond this it has spread up the hillsides in charming suburbs. Valparaiso is substantially built, clean, and pleasant, but it has few notable buildings. It is almost exclusively a commercial city, greatly surpassing Santiago. There is a large foreign population, and much of the trade is in the hands of British merchants. Most of the imports and a large part of the exports of Chile pass through Valparaiso. There is a naval arsenal, a naval school, etc., and the port is strongly fortified. Valparaiso was founded in September, 1544; was several times sacked by English and Dutch corsairs in the sixteenth century, and has suffered greatly from earthquakes and fires; March 31, 1866, it was bombarded by a Spanish fleet. The concluding battles of the Civil War of 1891 were fought in its vicinity, and it was taken and partly sacked by the congressional troops, August 28th. Pop. (1907) est. at 180,600. It is the capital of the province of Valparaiso, which has an area of 1,953 sq. m., and a pop. (1905) of 270,466.

Vambéry (vä̆m'bā-rē), **Arminius** (or HERMAN), 1832– ; Hungarian traveler and Orientalist; b. Szerdahely, near Pressburg, Hungary; went to Constantinople, where he acquired the Turkish language, and became so imbued with the Turkish mode of thought that he was able, with the assistance of the Academy of Pesth, to undertake a journey of exploration into Turkestan, disguised as an Oriental dervish, in 1862. He arrived in Khiva in 1863, visited Bokhara and Samarkand, and returned to Persia by way of Herat. After his return to Europe, Vambéry published an account of his journey, which was the first of the kind ever undertaken by a European.

Vam'pire, according to a superstition still existing among the lower classes in Hungary, Servia, Roumania, and the Christian population of the Balkan peninsula, a kind of ghost which during the night leaves the grave and maintains a semblance of life by sucking the warm blood of living men and women. It is probable that this superstition originated from the ancient myth of the *lamiæ,* but it was much strengthened by the belief, common in the Middle Ages all through the Greek Church, that the bodies of those who died under the ban of the Church were kept alive by the devil, and by him sent out to ruin their friends and relatives. Early in the eighteenth century a vampire panic spread over Servia and Hungary, and thence into Germany. Thousands of graves were opened, and corpses which looked suspicious were fastened with nails and bolts to the ground, that they should not wander any more. Among the Wallachs it is still customary to drive a nail through the head of the corpse into the bottom of the coffin.

Vampire Bat. See BAT.

Vana'dium, a metallic element discovered in 1801, related to phosphorus and arsenic. It is obtained from several minerals, vanadanite, roscoelite, etc., as a grayish-white metallic powder. Certain vanadium salts yield an intensely permanent black color, hence their application in the manufacture of inks and for dyeing.

Van Bu'ren, Martin, 1782-1862; eighth President of the U. S.; b. Kinderhook, N. Y. He began the study of law at fourteen, and took an active part in politics before he had reached the age of twenty; in 1812, was elected to the state senate; Attorney-general, 1815-19, and in 1816 again state senator. In 1818 he reorganized the state Democracy, and became a member of a clique of politicians known as the "Albany regency," which held control of the state for a score of years. In 1821 he was chosen a member of the convention for revising the state constitution, in which he advocated an extension of the franchise, but opposed universal suffrage; U. S. Senator, 1821-27, and reëlected, but resigned, having been chosen governor of the state. In 1829 he was appointed by Jackson Secretary of State, but resigned in April, 1831, and during the recess of Congress was appointed minister to England, whither he proceeded. The Senate refused to ratify the appointment, mainly on the ground that Mr. Van Buren, while Secretary of State, had foisted domestic party questions into his foreign diplomacy. In 1832 he was nominated as the Democratic candidate for Vice President, and elected. In 1836 he was elected President, receiving a majority of the popular vote and 170 electoral votes out of 294, Gen. W. H. Harrison receiving 73. The opening of his administration was at a time of severe financial difficulty, which resulted in the suspension of specie payments by the banks and in the crisis of 1837-39, and the President urged the adoption of the independent treasury system, which was twice passed in the Senate and defeated in the House, but finally became a law near the close of his administration. Another important measure was the passage of a preëmption law, giving actual settlers the preference in the purchase of public lands. Early in the administration occurred the insurrectionary movement in Canada, which was encouraged and aided by U. S. citizens on the borders. The President issued two proclamations against this violation of treaties, and sent a military force to the frontier to maintain order. The question of slavery began to assume prominence in national politics.

In the presidential election of 1840, Van Buren was nominated without opposition as the Democratic candidate, William H. Harrison being the candidate of the Whig Party. The Democrats carried only seven states, and out of 294 electoral votes only 60 were for Van Buren. The Whig popular majority, however, was not large, the elections in many of the states being very close. In 1844 Mr. Van Buren was proposed as the Democratic candidate for the presidency, and a majority of the delegates to the nominating convention were in his favor, but owing to his opposition to the proposed annexation of Texas he could not secure the requisite vote of two thirds; his name was withdrawn, and Polk received the nomination. In 1848, Lewis Cass was the regular Democratic candidate; a schism, however, sprang up in the party upon the question of the permission of slavery in the newly acquired territory, and a portion of the party, taking the name of "Free Soilers," nominated Van Buren; they drew away sufficient votes to secure the election of Gen. Taylor, the Whig candidate. In accepting the nomination Van Buren declared his full assent to the antislavery principles of the platform. After this, Van Buren retired to his estate at Kinderhook, where the remainder of his life was passed, with the exception of a European tour in 1853-54. He left a MS., which was edited and published by his sons, entitled "An Inquiry into the Origin and Course of Political Parties in the United States" (1867).

Vancou'ver, city, New Westminster district, British Columbia, Canada; on Burrard Inlet, and the Canadian Pacific Railway; 12 m. N. of New Westminster, and about 85 m. N. by E. of Victoria, the capital of the province. It is the largest city in British Columbia; is a seaport of the province. The city is laid out on the U. S. block system, with wide streets. It is the W. terminus of the railway, and has regular mail-steamer communication with China, Japan, and Australia. It has large and varied lumber interests, railway construction and repair shops, foundry and iron works, sugar refinery, and pork-packing works. Vancouver was laid out, totally destroyed by fire, and rebuilt in 1886, and has an area of more than 15 sq. m.; pop. (1910) 100,000.

Vancouver Is'land, in the Pacific Ocean; named after the navigator, George Vancouver (1758-98). It forms part of the province of British Columbia, being separated from the mainland by Queen Charlotte Sound, Johnstone Sound, and the Strait of Georgia; area between 15,000 and 16,000 sq. m. Throughout its length there extends a ridge of bare and rocky mountains averaging 3,000 ft., rising in Victoria Peak to 7,485 ft. The coasts, especially the W., are indented with narrow fiords, marked by steep, rocky cliffs, and sheltered nooks with fine harbors, notably those of Esquimalt, San Juan, Alberni Canal, Hesquiot, Pachena, and Quatsino. The N. and S. extremities of the island are comparatively flat, and the most settled portions are in the S., where Victoria is, and around the coal regions of Nanaimo on the E. coast. There are no navigable rivers, and the streams run short and rapid courses.

The climate in many respects resembles that of Great Britain, being modified by the Arctic currents that flow down along the coasts. The winter is open, mild, and wet; the spring is later, and the summer hotter and drier than in England. The larger portion of the island is unsuited for agriculture, being little better than bare rock. The most general crops are wheat, oats, barley, and all sorts of vegetables. Fruit culture is being developed. The principal mountain range has been found to contain in many places gold, silver, iron, copper, lead, and other metals. In the vicinity of Alberni, gold-bearing quartz ledges contain gold in paying quantities. Marble of a fine quality has been discovered. Coal is abundant. The panther, bear, and wolf are found in the forests; two kinds of deer, grouse, quail, pheasants, and other wild fowl abound, and the many lakes are full of fish. Extensive banks lie off the SW. coast well stocked with cod, halibut, whiting, sturgeon, and herring, and deep-sea fishing is becoming one of the main industries, together with the lumber industries, shipbuilding, and coal mining. The capital is Victoria. The island was discovered in 1592 by Juan de Fuca, was visited in 1792 by Capt. Vancouver, and was ceded to Great Britain by treaty with the U. S. in 1846. In 1848 it was leased to the Hudson Bay Company for ten years, and was an independent crown colony till 1866, when it was united with the mainland as part of the colony of British Columbia.

Van'dals, an ancient Germanic race belonging to the group of Gothic tribes. They were divided into the Asdingian and Silingian sections, and occupied in the second century the upper Oder, the Riesengebirge (*Montes Vandalici*), and the Sudeten, approximately the present province of Silesia. During the Marcomannic wars with Marcus Aurelius (161–180 A.D.) the Asdingi were allies of the Quadi and Marcomanni in Dacia, while the Silingi migrated westward abt. 280, and located on the Middle Main. The former were partly destroyed by the Gothic king, Geberic(h), in a battle on the Maros River, where their king, Wisumar, was slain; the remnants were permitted by Constantine the Great to settle in Pannonia abt. 334, and became Arians. Allied with the Suevi and Alani, and reunited with the Silingi, they suddenly invaded Gaul in 406, under their king, Godigisel, and under his son Gunderic(h) they crossed the Pyrenees into Spain in 409. After severe wars against the Visigoth king, Wallia (415–418), and a victory over the Roman Castinus (422), the Vandals founded an independent kingdom, *Vandalitia*, now Andalusia. Gunderic was succeeded by his illegitimate brother Genseric, or Geiseric, in 427.

Two years later Bonifacius, governor of the Roman province of Africa, called the Vandals to Africa. Genseric crossed the Strait of Gibraltar with about 80,000 persons, of whom 50,000 were warriors. Meanwhile Bonifacius, through the good services of St. Augustine, had become reconciled to the Emperor Valentinian III, and ordered the Vandals out of the country. But Genseric defeated Bonifacius and conquered the whole of the N. coast of Africa as far as Tunis, broke the peace concluded with the Romans in 434, and five years later took Carthage and made it the capital of the Vandal kingdom. He developed a powerful fleet, with which he conquered the Baleares, Corsica, Sardinia, and W. Sicily, invaded Italy, and in 455 captured and sacked Rome, and carried away nearly all its movable wealth to Carthage. Genseric held out against both the W. and E. Roman emperors, but died in 477. The Vandal kingdom began to decline, under his successors, Hunneric (477–484), Guntamund (484–496), and Thrasamund (496–523), all of whom exasperated their Roman subjects by bloody persecutions, while Hilderic (523–530), by favoring the Romans and the orthodox Church, alienated his Vandal subjects, and was dethroned by Gelimer, his uncle. The Byzantine emperor, Justinian I, sent an army to Africa under Belisarius, who defeated Gelimer at Tricamarum. Most of the surviving Vandal warriors were drafted into the imperial army, and disappeared in the wars against Persia.

Van'derbilt, Cornelius, 1794–1877; American financier and capitalist, called Commodore; b. near Stapleton, Staten Island, N. Y.; the son of a farmer. At sixteen he carried passengers and produce between New York and Staten Island. With his profits he soon had interests in many boats, ferries, etc., in the vicinity of New York. Soon after the discovery of gold in California he put into operation a line of steamers that made rapid time by transferring its passengers across the Isthmus of Nicaragua, and in this enterprise he accumulated $10,000,000. When British vessels were withdrawn from ocean traffic on account of the Crimean War, he established a line to Havre, France, but soon disposed of his shipping interests to invest in railways. In 1863 he purchased stock of the New York and Harlem Railroad, and later secured the Hudson River Railroad, after which the New York Central passed into his control, and he became its president, 1867. By consolidation and purchase he extended his system to Chicago. He contributed $1,000,000 to found Vanderbilt Univ., and gave $50,000 to establish the Church of the Strangers in New York; also in 1863 he presented his finest steamship, the *Vanderbilt*, to the U. S. Govt., for which Congress voted him a gold medal. His fortune was estimated at $100,000,000.

The bulk of his fortune was left to his son William Henry (1821–85), who as a young man was compelled to make his own way, owing to an unbelief in his abilities by his father. Later he was given the receivership of the Staten Island Railroad, which he conducted with such skill that he was connected with the railway ventures that the elder Vanderbilt became interested in, and after the Commodore's death further extended the system. Besides many other gifts, Mr. Vanderbilt gave $200,000 to Vanderbilt Univ., paid the expenses of the removal of the obelisk from Egypt to Central Park, New York, and gave $500,000 for the erection of the buildings of the College of Physicians and Surgeons. The great fortune that he inherited was largely increased, and, after leaving $10,000,000 to each of his eight children and $1,000,000 to charity, the remainder was left to the management of his two elder sons.

Vanderbilt Univer'sity, an institution of learning at Nashville, Tenn.; in part the outgrowth of a general movement for higher education throughout the Methodist Episcopal Church South. In response to special calls a convention met in Memphis, January 24, 1872, composed of delegates from Tennessee, Alabama, Mississippi, Louisiana, and Arkansas. A general plan for a university was adopted, a board of trust nominated, and shortly afterwards a charter secured, under the title of the Central Univ. of the Methodist Episcopal Church South. The efforts to raise the necessary funds met with little success, and the enterprise seemed doomed to failure, when the elder Cornelius Vanderbilt, of New York, made, through Bishop McTyeire, an offer of $500,000. In recognition of this handsome gift the name was changed to Vanderbilt Univ. Mr. Vanderbilt made further donations at various times. In 1909 it supported 125 instructors and had 960 students. The library contains 40,000 volumes.

Van Diemen's (văn dē'mĕnz) **Land,** a former name for Tasmania.

Vandyke, or Van Dyck (-dīk'), **Sir Anthony,** 1599–1641; Flemish painter; b. Antwerp. In 1627 he executed for the Church of the Augustinians in Antwerp a celebrated picture representing St. Augustine in ecstasy, supported by angels. For the next five years he was employed in the Netherlands; to this period may be ascribed numerous "Crucifixions" and "Pietas," impressed with that character of sorrow and reserved dignity for which he has always been distinguished. But his greatest reputation was won by his portraits, which led to his being, in 1632, invited by Charles I to England, where he was knighted and pensioned. The best of his works are in that country, prominent specimens being his several portraits of Charles I and those of the earls of Strafford and Pembroke. The number of works attributed to him is enormous.

Vane, Sir Henry, 1612–62; English statesman; b. Hadlow, Kent; educated at Oxford, and completed his education at Geneva, where he became a Puritan and a republican; went to Massachusetts Bay, 1635; was chosen governor, 1636, but, having favored religious toleration, was not reëlected; returned to England in 1637; was knighted, elected to Parliament, and made joint treasurer of the navy, 1640; took part in the impeachment of Strafford, 1642; was a zealous supporter of Parliament in the civil war; enabled Roger Williams to obtain the Rhode Island charter, 1643; was a promoter of the "Self-denying Ordinance," 1644.

He was a member of the Westminster Assembly and a leader of the Independents in Parliament, but opposed Cromwell's arbitrary course; and after the dissolution of the Rump Parliament, 1653, retired to his estate of Raby Castle, where he wrote religious treatises and political pamphlets, one of which led to his imprisonment by order of Cromwell, 1656; remained in opposition until the death of the Protector, when he was chosen to Parliament; became the leader of the republican party; was one of the twenty persons excepted from the act of general pardon and oblivion passed at the Restoration; was sent to the Tower, and afterwards to other prisons, remaining two years in a castle in the Scilly Islands, occupied in theological studies and writing; tried for high treason, unjustly convicted, and was beheaded on Tower Hill, June 14, 1662. His theological writings are pitched in so high a strain of mysticism as to be almost unintelligible to ordinary readers, but are said to display astonishing powers; and he has been ranked as one of the most profound minds that ever existed—not inferior, perhaps, to Bacon. His religious views were millenarian, and gave rise to a small circle of disciples known as Vanists.

Vanil'la, the fruit of the *Vanilla planifolia* and of the *V. aromatica,* climbing plants of the orchid family, natives of Mexico and Brazil. *V. planifolia* is cultivated in several tropical countries. The pods are from 6 to 12 in. in length, contain many minute black seeds, possess a very pleasant odor, and are often incrusted with needle-shaped crystals of vanillin, their aromatic constituent. They also contain an iron-greening tannin, a fatty oil, and a resin. Vanillin, the odorous principle of vanilla, is prepared artificially by a number of methods, and as vanilla beans are expensive much of the artificial vanillin is used. Vanilla is chiefly used for flavoring chocolate, confectionery, perfumery, etc., and in medicine as a mild stimulant.

Van Rensselaer (rĕns'sĕ-lĕr), **Stephen,** 1765–1839; American statesman; known as "the patroon"; b. New York; was the fifth in descent from Killian van Rensselaer, the original patroon or proprietor of a large tract of land on the Hudson River granted by the States-General of Holland; graduated at Harvard College, 1782; member of the assembly, 1789; state senator, 1790; lieutenant governor, 1795; and leader of the Federalists in New York State. From 1816 to his death he was one of the Erie Canal commissioners. He was in command of the state militia at the beginning of the War of 1812, and directed the unsuccessful assault upon Queenston Heights; 1819, regent of the New York Univ., and later chancellor; in 1821–23 instituted the geological surveys of New York, which were executed wholly at his cost by Amos Eaton, and in 1824 established at Troy a scientific school for the instruction of teachers, which was incorporated in 1826 as Rensselaer Institute, half the current expenses being for some time defrayed by him. Member of Congress, 1823–29, and it was by his casting vote in the New York delegation that John Quincy Adams was made President of the U. S. He married a daughter of Gen. Philip Schuyler.

Van Tromp. See Tromp, M. H. van.

Va'pors, the gaseous forms of substances which under normal conditions usually exist in a liquid or solid state. They are distinguished from gases proper, which are elastic fluids under ordinary conditions. The vapor of water, called steam, is a transparent gas, and should be distinguished from the cloud produced by a jet of steam, which is condensed water. See Evaporation; Gas.

Va'riables, quantities which admit of an infinite number of sets of values in the same equation. Thus in the equation $y^2 = 2px$, x and y are variables, because there is an infinite number of sets of values of these quantities that satisfy the equation. If there are two or more variables in an equation, all but one may be regarded as independent. Because one variable always depends on the form of the equation as well as on the values assigned to the others, it is called the dependent variable or the function.

Varia'tion. See DARWINIANISM and EVOLUTION.

Varicose (văr'ĭ-kōs) **Veins,** relaxation of the coats of the superficial veins, with increased caliber, occurring most frequently in the lower extremities. Gravitation and the difficulty of the ascent of blood from the feet to the body determine the greater frequency of the disease in the veins of the legs. Varicose veins are common in aged men, the result of senile degeneration of the various tissues; less often it occurs in midlife in robust men of the gouty habit and those who are kept standing; walking does not favor the condition, since the movements of the superficial muscles and tension of the skin help to lift the blood upward. Even in youth violent exercise causes a breaking down of the valves in the veins and venous dilatation. In women the chief and not infrequent cause is pregnancy. Varicocele in the male is a local varicosity of the spermatic veins. Hemorrhoids or piles are due to repeated passive congestions of the hemorrhoidal veins. The veins are tortuous and pouched. Varicose veins do not necessarily indicate debility or degeneration, but should warn the patient to abandon vocations involving violent exertion, to regulate the diet and bowels habitually, and to remove any rheumatic or gouty vice. The varicose limb may be benefited by daily friction, cold effusion, and salt bathing. But the extension of the disease is best checked by constant external support, and cure is insured by cutting through the superficial veins so as to drive the blood current into the deeper veins.

Vari'ola and Va'rioloid. See SMALLPOX.

Var'na, or **Warna,** seaport of Bulgaria, on the W. shore of Black Sea. It has trade in wheat, barley, wool, leather, etc., with Constantinople and the W. of Europe. Here in 1444 the sultan, Amurath II, overwhelmed the Hungarians, and here in 1854-55 the allies organized the invasion of the Crimea. Pop. (1905) 37,417.

Var'nish, a resinous solution employed for coating objects to produce a thin, transparent, and hard surface, forming a protection against moisture and air. The principal resins employed are the gums copal, shellac, animé, mastic, and sandarac; the solvents being alcohol, wood spirit, oil of turpentine, linseed, and other drying oils. From the nature of the solvent used varnishes may be conveniently divided into fixed oil, spirit, volatile oil, and ether varnishes.

Fixed-oil varnishes, which possess great durability and luster, are usually prepared from linseed oil, which, on being oxidized by the action of the air, is converted into a tough, elastic substance, the change taking place more rapidly in a boiled oil. The proportions by weight of the ingredients composing an ordinary oil varnish are as follows: resin (copal, amber, etc.), 10; boiled linseed oil, 5 to 25; oil of turpentine, 15 to 25. As a rule, varnishes of this composition improve with age. An amber varnish, which possesses great durability, but dries slowly, has the following composition: resin (*amber colophonium*), 1 lb.; boiled linseed oil, 10 oz.; oil of turpentine, 1 pint. A good carriage varnish is made from gum animé, 8 lb.; boiled linseed oil, 3 gal.; camphor, ¼ lb.; litharge, ¼ lb.; oil of turpentine, 5½ gal. A black asphalt varnish, suitable for ironwork, can be made from asphalt, 3 parts by weight; boiled linseed oil, 4; oil of turpentine, 15 to 18; or from foreign asphalt, 45 lb.; linseed oil, 6 gal.; litharge, 6 lb.; boil, then add dark fused gum amber, 8 lb.; hot linseed oil, 2 gal.; boil again, remove from the fire, and thin down with oil of turpentine, 25 gal. A good wainscot or mahogany varnish is obtained from sorted gum animé, 8 lb.; clarified linseed oil, 3 gal.; litharge, ¼ lb.; dried lead acetate, ¼ lb.; oil of turpentine, 5½ gal. The addition of India rubber or gutta percha to oil varnishes imparts further flexibility to the product.

Spirit varnishes (*lac varnishes*) differ from the preceding in being true solutions of resins. The solvents most employed are alcohol and wood spirit. Acetone, benzene, etc., are also occasionally used. The gums chiefly employed are sandarac, mastic, shellac, and animé. Sandarac confers hardness on varnishes; mastic imparts a gloss. Shellac is rendered more soluble by being powdered and exposed to the air for a long time. The spirit used as the solvent should not be less than ninety-five per cent in strength. In the preparation of spirit varnishes, the resins, before being added to the solvent, should be well pulverized and mixed with sand or broken glass, in order to prevent the gum from forming into lumps. The tendency of the varnish to "chill" or give a rough surface is obviated by the addition of a little ammonia or gum sandarac, excessive brittleness being remedied by the addition of Venice turpentine. Sandarac varnish is prepared by dissolving 10 parts of the gum and 1 part of Venice turpentine in 30 parts of spirit. Ordinary copal varnish is made by first melting the resin at a gentle heat, then powdering it with sand, dissolving in strong alcohol, and filtering. Elemi resin, or solution of turpentine, is sometimes added to give greater softness. A colorless copal varnish is prepared by dissolving 6 parts of pulverized and fused copal in 6 parts of strong alcohol, and adding 4 parts of oil of turpentine and 1 part of ether. Colored spirit varnishes, or *lacquers*, are used to impart a gold color to instruments made of brass and other base metals. Tinctures of gummi gutta, dragon's blood, gamboge, coralline, picric acid, turmeric, Martius yellow, annotto, etc., are separately prepared and added in the proportions necessary to give the required color to a varnish consisting of seed lac, 2 parts; sandarac, 4 parts; elemi, 4 parts; alcohol, 40 parts. The following mixture furnishes a good gold lacquer for brasswork: seed lac, 3 oz.; turmeric, 1 oz.; dragon's blood, ¼ oz.; alcohol, 1 pint. Aniline colors have been employed to impart various tints to spirit varnishes, which are especially adapted to the coloring of glass, the bronzing of leather, etc.

In *volatile-oil varnishes* the solvent is oil of turpentine. They are more durable than spirit varnishes, and are less brittle, but require more time in drying; they also differ from the latter in improving by age, whereas spirit varnishes usually deteriorate in quality. The resins employed (gum copal, gum damar, Canada balsam, etc.) are commonly directly dissolved in the oil of turpentine, with or without previous fusion, the usual proportions being about 5 lb. of the resin to 7 lb. of the solvent. *Ether varnishes* consist of an ethereal solution of a resin. They have a very limited application. The following is sometimes used for the repairing of jewelry: copal, 5 parts; ether, 2 parts. A varnish for photographers' use is prepared by dissolving 3 or 4 grains of amber in 1 oz. of chloroform. Besides the varieties of varnish already mentioned, numerous other preparations are used for special purposes. A varnish consisting of 1 part gutta percha dissolved in 5 parts oil of turpentine, to which 8 parts of hot linseed oil are added, does not scale, and is sometimes used for maps. Wax varnish, or milk of wax, is prepared by melting 1 lb. of white wax at a low heat, adding 1 pint of warm alcohol (ninety per cent), mixing, and pouring the liquid out on a cold slab, on which it is ground to a smooth paste. An emulsion with water is then made and strained through muslin. This preparation is extensively employed as a protective coating for old paintings, upon which it is first allowed to dry, and then equally fused by passing a warm iron over it. The preparations used for varnishing guns, engravings, leather, etc., differ little from those described above, although in the case of leather the article is usually dried in an oven after varnishing, the process being called japanning. See JAPANNING; PAINT.

Var'ro, Marcus Terentius, 116–28 B.C.; Roman scholar. At the commencement of the civil war he was serving in Spain as legate of Pompey, and remained faithful to him until his overthrow at Pharsalia (48). Cæsar treated him kindly, and employed him to superintend the collection and arrangement of the works in the public library at Rome. From this time Varro lived in retirement. He wrote seventy-four works in 500 or 600 books, all of which have perished except a treatise on agriculture, preserved entire, and a work on the Latin language, which remains in a mutilated state.

Va'rus, Publius Quintilius, Roman general, consul in 13 B.C. In 7 A.D. he was governor of the territory between the Rhine and the Elbe. In 9 A.D. a secret insurrection against the Roman power was organized under Arminius. Varus, with the Roman army, was lured into an ambuscade in the Teutoburg forest, and suffered total defeat, the leader committing suicide. It was the greatest calamity of Augustus's reign, and the first time that Roman arms retreated from territory which they had once occupied. The region was never reconquered.

Va'sa, Gustavus. See GUSTAVUS I.

Vásárhely (vä'shär-hĕ-ly), full name HÓD-MEZÖ-VÁSÁRHELY, to distinguish it from Maros-Vásárhely, in Transylvania, city; in the county of Csongrád, Hungary; on the Hód Lake; station of the Alföld-Fiume Railway. The city is rapidly improving, and has many noteworthy public buildings; among them numerous churches, a Protestant gymnasium, a royal law court, and a townhall, besides two banks, two hospitals, large breweries, and an oil factory. It has a flourishing trade in the products of the fertile country surrounding it —wheat, grain, barley, oats, maize, fruits, white and red wine. Cattle and horses of the best breeds in Hungary are extensively raised. In spite of enormous dikes, the city frequently suffers from the inundations of the river Theiss. Pop. (1900) 60,883, mostly Magyars and Roumanians.

Vasa'ri, Giorgio, 1511–74; Italian painter, architect, and biographer; b. Arezzo. He studied under Guglielmo da Marsiglia, Luca Signorelli, Andrea del Sarto, and Michelangelo. He became discouraged, and for a time gave up painting and went to Florence, where he took up the goldsmith's art. In 1529 he went to Rome, where he worked at drawing ancient monuments with such assiduity that he fell ill of fever. He turned his attention to architecture, and soon became one of the most accomplished of his time in that department. It was in Rome, while painting the scenes from the life of Paul III in the Sala della Cancelleria of the Vatican, that he became known to Paolo Giovio, who seems to have suggested to him the writing of the work, "Lives of the Painters, etc.," to which he chiefly owes his fame. Vasari was also the originator of the Florentine Academy, which was founded abt. 1561. Besides his "Lives" he wrote several treatises on the fine arts. Vasari's paintings suffered from too facile and hasty execution, and from his employment of incompetent assistants.

Vas'co da Ga'ma. See GAMA, VASCO DA.

Vas'cular Tis'sue, in plants, the fibrovascular system, composed of vessels and ducts. See HISTOLOGY.

Vase (vās or väz), an ornamental vessel, usually of pottery and of greater height than breadth. The earliest Greek vases are those exhumed by Schliemann at Hassarlik. They are rudely made ampullæ or two-handled vases, made of clay, some roughly shaped to resemble natural objects. Vases from Cyprus and the Ægean Islands are somewhat finer, often ornamented and roughly painted. Some of them are thought to date from between the twentieth and fifteenth centuries B.C. Mycenæan ware, ornamented with painted geometrical designs, was the most popular till, between 650 and 300 B.C., there arose in Athens the great art of black-figure and red-figure pottery. Figures, mainly mythological, were laid on in a lustrous black varnish whose composition is now unknown. The vases ornamented with red figures came later, and show greater artistic skill. About the time of Alexander the Great the making of the finest vases passed from Athens, and Apulia became the center for amphoræ, or wine flasks, of huge size, magnificent shape, and rich coloring. The Lucanian and Campanian red-figure vases were of distinct type and ornament, but inferior to the Apulian. Murrine vases, *i.e.*, vases made of murra, supposed to be porcelain or iridescent glass, were highly esteemed by the Romans. The Romans imported artistic vases from the Etruscans, and many of these vases have come down to us. At Arretium most of the coarser kinds were made. Cameo vases, of which the Portland or Barberine vase is a celebrated example, were made of two layers of glass, the outer layer being opaque and cut down to form figures in relief. The vases of the best classical period were of delicate proportions and fine strong lines, ornament being subordinated to use, and only in the earliest times and later, when the art degenerated, were the vases molded into resemblances of natural objects. Among Asiatics the Chinese and Japanese vases of jade or porcelain are noted for elegance and ornamentation. Since the fifteenth century Venice has produced glass vases of high excellence. The modern artistic development of vases is typified in the magnificent works of Sèvres, France; in the Doulton ware of England, and such artistic products as the Rookwood ware of the U. S.

Vas'eline, a name given to a product obtained from petroleum after the lighter hydrocarbons are driven off, and composed of a mixture of paraffins. It is used as a base for ointments, pomades, cold cream, etc., and for coating surgical instruments and steel surfaces generally to protect them from rust.

Vassar Col'lege, an institution at Poughkeepsie, N. Y.; founded by Matthew Vassar in 1861, and opened to students in 1865. It was the first amply endowed and adequately organized college for women. The original gift was $428,000, expended for buildings and other equipments. The buildings are in the midst of about 500 acres of land, much of which is laid out as a park. The main building, which is 500 ft. in length, is modeled after the Tuileries. It is 3 m. from the Hudson, and is connected with the river by an electric railway. In 1909 there were 101 instructors and 1,039 students. The library contains 66,000 volumes.

Vat'ican Coun'cil, the twentieth ecumenical council of the Roman Catholic Church, held in St. Peter's in Rome, December 8, 1869, to September 1, 1870. It defined the doctrine of the church concerning God the Creator, revelation, the nature of faith, and the relation between faith and reason, and especially the primacy and infallibility of the Roman pontiff. See INFALLIBILITY OF THE POPE.

Vatican Pal'ace, the official residence of the popes since the fifteenth century. The Vatican Hill was not included in ancient Rome, and the earliest wall that inclosed it was built under Pope Leo IV about 850 A.D. Before that time the popes had a villa on this site because of its nearness to the Basilica of St. Peter. Their official residence was the Lateran Palace. When Gregory XI (1370–78) returned to Rome from Avignon the Lateran was in a ruinous condition, and since then the Vatican has generally been the papal residence and the meeting place of the conclaves for the election of new popes. Under Nicholas V (1447–55) the rebuilding of the palace began in a serious fashion and on a large scale, and was continued under later popes. The entire mass of buildings, inclosing and fronting on twenty different courts and roughly computed to contain 11,000 rooms, has no exterior architectural effect, but seems an accidental gathering of buildings of different characters. It contains, however, much architectural display in the buildings on the courts and in the interiors of halls and galleries, and is noted for the wall paintings, such as those by Perugino, Signorelli, Botticelli, Rosselli, Ghirlandajo, and Michelangelo in the Sistine Chapel; those by Raphael and his pupils in the Stanze di Raffaello; and by Giovanni da Udine and by Raphael himself and his other pupils in the loggie on the Court of S. Damaso. The palace contains the largest collection of classical statuary in Europe, although most of the pieces are Roman copies of Greek originals. There is an Etruscan museum of interest and a small Egyptian museum. The picture gallery contains few works, although they are of great importance. The tapestries in the Galleria degli Arazzi are notable. Ancient maps of interest are contained in the Galleria Geografica. The library is famous for its magnificent collection of manuscripts and its rare early printed books. In connection with the library is an immense collection of gems and small objects of value, Christian antiquities, and objects of art presented to different popes by sovereigns and others. The papal manufactory of mosaic is also contained in the palace.

Vauban (vō-bäṅ'), **Sébastien Leprestre** (**Marquis de**), 1633–1707; French military engineer. He enlisted under the rebellious Prince de Condé in 1651, but resumed his allegiance to the king, and in 1655 became a royal engineer. He invented the bastioned system of fortification and the use of parallels in sieges and of the ricochet fire. In 1667 he was wounded at the siege of Douai. During the invasion of Holland, he took Maestricht and other strongholds (1673–75) by means of his new system of attack. In 1677 he captured Valenciennes and Cambrai, and became commissary general of fortifications. In the war against the League of Augsburg, he took Phillipsburg, Mannheim, Mons, Namur, and other towns (1688–93), and in 1703 he was made marshal. He devised and nearly completed a strong line of fortresses to protect the frontiers and coasts of France, constructed aqueducts and moles, and laid out and improved numerous seaports. His system of attacking a fortified place by regular approaches still prevails. His principal military writings comprise his celebrated "Traité de l'attaque et de la défense des places" and "Traité des mines" and "Traité des siéges."

Vaucanson (vō-käṅ-sōṅ'), **Jacques de,** 1709–82; French mechanician. The statue of the "Flute Player" in the gardens of the Tuileries suggested to him his automaton player, and he produced many such works, including a brass duck which could fly, quack, eat, and apparently digest its food. He became inspector of silk manufactures, and, being attacked by the Lyons workmen for his improvements in machinery, constructed an automaton ass weaving flowered silks.

Vaudeville (vōd'vĭl), believed to be from Les Vaux de Vire, two valleys in Normandy, where dwelt Olivier Basselin in the fifteenth century; a name at first applied to satirical songs relating to current events, for the composition of which Olivier Basselin was famous. The name is now applied to a light dramatic entertainment interspersed with music, and having humorous or satirical allusions to topics of the day.

Vaudois. See Waldensian Church.

Vaughan (vân), **Herbert,** 1832–1903; English cardinal; b. at Gloucester; entered the priesthood, and ordained 1854; vice president of St. Edmund's College until 1862; founded St. Joseph's Missionary College at Mill Hill, Middlesex, 1869, and its president general until 1903; elected Bishop of Salford; succeeded Cardinal Manning as Archbishop of Westminster, 1892; called to Rome in 1893 to be created a cardinal. He twice visited the U. S. in connection with his missionary work. He was the proprietor of the *Tablet* and of *The Dublin Review* and prominent in temperance and rescue work.

Vault, a roof or ceiling built of solid blocks kept in place mutually on the principle of the arch. There is no difference except of extent between an arch and a vault, but the mere fact of greater extent causes the existence of varieties in the vault. Thus a cupola or dome is a vault, but is different in character from an arch in an ordinary wall. See Crypt.

Vauxhall', a once famous public garden in London, fashionable from 1660 to 1859.

Vecel'lis, Tiziano. See Titian.

Ve'da. See Sanskrit Literature.

Vedan'ta, the Brahmanical philosophy founded upon the Upanishads as scripture or revelation (see Sanskrit Literature). As a system, it probably originated about the beginning of our era. The principal object of the Upanishads is the inquiry after the One Eternal, or Brahman, and the statement of the proposition that the innermost self of the individual is identical with that all-pervading power.

The Vedanta, like all the philosophical systems of India, has for its object the release of the soul from the bonds of corporeal existence and the teaching of the means of escape from the distressful round of rebirth. Since the seventh century B.C. all Aryan India, with the exception of the materialists, or Charvakas, has been under the influence of the general belief in the transmigration of souls (samsara), and in the after effect of deeds in one existence as determining destiny in another (karma). According to the Vedanta, the only release (mukti or moksha) from this endless round of birth and death is to be won by the attainment of knowledge, or jñana.

Ved'dahs, a primitive hill tribe of Ceylon. They numbered in 1881 2,228 individuals, of whom about 200 were wild, the remainder being partly civilized. The interest in them lies in the fact that they are one of the rare remnants of the primitive types of mankind. They are small (men 5 ft. 2 in., women 4 ft. 10 in.), brown, with undulating hair; the capacity of the skull is remarkably small, but the profile is straight and fine. The wild Veddahs are clever archers, live by hunting, have the simplest dwellings, and wear little or no clothing. The internal government is patriarchal. The Veddahs make good husbands and fathers, and are docile, somber, hospitable, courageous, honest, contented, very truthful, jealous, and vindictive—on the whole, much more like Rousseau's idealized primitive man than like the conventional savage. They form the subject of a considerable literature, some of it fanciful and apocryphal.

Ved'der, Elihu, 1836–   ; American painter; b. New York; pupil of Picot, Paris; National Academician, 1865; honorable mention, Paris Exposition, 1889. He went to Italy in 1856, and has resided almost continuously in Rome since then. He illustrated "The Rubaiyat" of Omar Khayyam, and his decorative work shows fertility of invention. Among his best-known pictures are "The Lair of the Sea Serpent," "Young Marsyas," "Cumæan Sibyl," and "Good and Bad Government," the last in the Library of Congress, Washington, D. C.

Vega (vā'gä), **Lope de** (Lope Felix de Vega Carpio), 1562–1635; Spanish dramatist. He left the Royal College of Madrid to serve against the Portuguese, and afterwards became secretary to Duke Antonio de Alva, but was imprisoned on account of a duel and exiled. In 1588 he joined Philip II's armada against England. Having lost his second wife, he became a priest in 1609, and in 1628 was chief chaplain to a congregation in Madrid. He produced most of his pieces during his connection with the Church. His fertility and rapidity of execution were marvelous. He wrote about 1,800 plays, several epics, prose romances, etc. His dramatic genius embraced the whole range of the art. He founded the Spanish national drama. Among his best-known pieces are "Los tres dimantes," "La fuerza lastimosa," "La discreta enamorada," "La dama melindrosa," and "El padre engañado."

Veg'etable King'dom, the plant world; the aggregate of organisms called plants. It is coördinate with the animal kingdom, and these two include all the forms of organic life on the earth. The vast assemblage of plants constituting the vegetable kingdom includes, according to estimates made by Saccardo, about 400,000 species, less than half of which have been described. The six branches are *Protophyta* (Protophytes, water slimes), *Phycophyta* (Phycophytes), *Carpophyta* (Carpophytes), *Bryophyta* (Bryophytes, mossworts), *Pterido-*

phyta (Pteridophytes, fernworts), ***Anthophyta*** (Anthophytes, flowering plants). See also BOTANY.

Vegetable Silk. See SILK, VEGETABLE.

Vegetable Wax. See WAX, VEGETABLE.

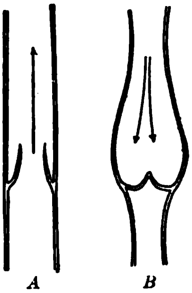
Vegeta'rianism, a view according to which vegetable substances ought to form the sole food of man, while the use of animal substances, or at least of meat proper, ought to be avoided in the diet as something wrong, both physiologically and morally. Many of the ancient philosophers, as Plato, encouraged a vegetable diet as the most suitable for the well-being of man, physically and morally; and some of them, as Pythagoras, absolutely forbade the use of animal food. In modern times the view found advocates in Rousseau, Shelley, and others, and in 1847 a society for the propagation of vegetarianism was formed at Manchester, England. A similar society was formed in the U. S. in 1850.

Vegetarians claim that abstaining from meat lessens the liability to disease, has a calming effect on the mind, and prolongs life. On the other hand, the highest races of mankind have lived on a mixed diet, and the anatomy of the human teeth, stomach, and intestines indicates that a mixed diet is the natural one for man. The cheapness of vegetarian diet is a strong point in its favor. To obtain all the albuminates necessary from a vegetable diet, a great excess of starch must be eaten, and, further, vegetable albuminates are not as readily digested as flesh albuminates. It is said that a wholly vegetable diet produces hardening of the arteries and premature old age.

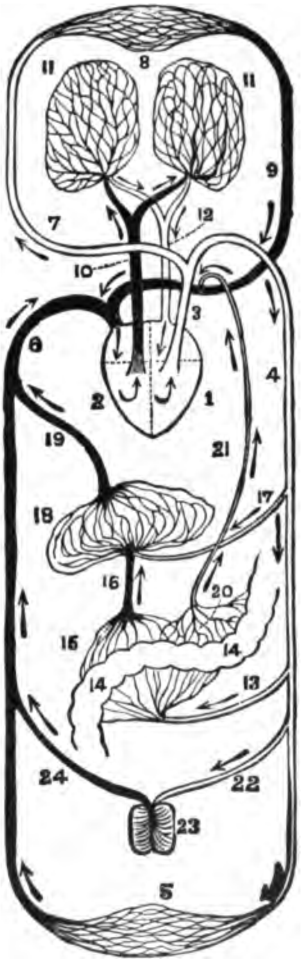
Vehicles. See CARRIAGES.

Veh'mic Court. See FEHMIC COURT.

Veins, the companion vessels to the arteries, distributed throughout the body to return the venous or impure blood from the extremities, surfaces, and viscera to the right auricle of the heart, and the purified blood from the lungs to the left auricle. They are membranous canals, essentially devoid of elasticity and without pulsation. They arise from venous capillaries which collect from the tissues the blood recently brought to them by the arterial capillaries. These venous capillaries unite to form ultimate veins, which still again unite, and form successively larger branches and trunks as they approach the center of the circulation. The motion of venous blood is secured in part by the power of the capillary chemico-vital nutritive processes, in part by the pressure of the moving muscles and viscera between which the veins are imbedded, the veins being provided with valves which admit of blood currents toward the heart, but not the reverse. Blood flows from a cut vein in a steady stream, not in spurts, as it does from a cut artery. Veins have three coats—internal, middle, and external. The veins are not uniform, symmetrical cylinders, like the arteries, but have pouches or sinuses adjacent to the valves, so that a vein distended resembles a bamboo stick with bulbous or knotted joints. The veins, like the arteries, have nutrient vessels in their walls.



VALVES OF VEINS. *A*, valve open; *B*, valve closed.



THE CIRCULATION OF THE BLOOD IN THE BODY. The arrows show the direction of flow. The black channels are the veins, and the unshaded the arteries (except Nos. 10 and 12). 1 is the left side of heart; 2, the right side; 3, the aorta from the left ventricle; 4, artery to abdomen; 5, capillaries; 6, vein from abdomen; 7, artery to head; 8, capillaries; 9, vein from head; 10, artery from right ventricle to lungs; 11, the lungs; 12, vein from lungs to left auricle; 13, artery to intestines; 14, small intestine; 15, capillaries and veins from intestines carrying away digested food; 16, portal vein; 17, artery to liver; 18, liver; 19, vein from liver; 20, lacteals; 21, duct leading to vein going to the heart by which some absorbed material is taken into circulation; 22, artery to the kidneys; 23, the kidneys; 24, vein from the kidneys.

The veins of bones are termed sinuses, their outer coat being replaced by the fibrous lining of the bone, as in the great sinuses of the skull. The venous blood returned by the veins from above the region of the heart is united in one great vein, the *vena cava superior*, all from below entering by the *vena cava inferior*. The *vena azygos* collects the blood from the chest walls and other structures which does not flow into either of the *venæ cavæ*. The portal vein receives the venous blood from the intestines and conveys it to the liver. The pulmonary vein and branches go from the lungs to the left auricle of the heart, carrying the blood that has been revivified by the oxygen of inspired air. See ARTERY; CIRCULATION OF THE BLOOD.

Velasquez (vā-läs'kĕth), **Diego Rodriguez de Silva y,** 1599–1660; Spanish painter. He studied under the elder Herrara and Francisco Pacheco at Seville, but was mainly self-taught. His chief model was a peasant boy, whom he painted in his rags in every variety of expression and attitude; and he excelled in still life. A well-known specimen of his early works, "The Water Carrier," is at Apsley House, London. In 1622 he went to Madrid, and, his portrait of Philip IV being greatly admired, he was appointed court painter. In 1627 his "Expulsion of the Moriscos from Spain" gained him the appointment of usher of the chamber. His finest works include the celebrated "Meninas," representing the Infanta Margarita and her maids of honor, which, in respect to aërial and linear perspective, local color, and animal and human life, is held to be almost unrivaled. He was appointed chief chamberlain in 1652, and afterwards painted but little. The Royal Gallery in Madrid contains about sixty of his works, comprising portraits, history, genre, and landscape, in all of which he was equally great.

Vel'lum. See PARCHMENT.

Velocipede (vē-lŏs'ĭ-pēd), originally a vehicle invented in 1816 by Baron Drais de Sauerbrunn, of Mannheim, consisting of a seat resting upon two wheels, one before the other. The rider sat astride the seat and propelled the vehicle by striking the ground with his toes. Later velocipedes were propelled by the action of the feet upon a crank attached to the axle of the forward wheel. Velocipedes are now called unicycles, bicycles, tricycles, or quadricycles, according to the number of wheels (see BICYCLE). Few things are more puzzling to the ordinary observer than the self-balancing of the bicycle. The principle by which the skilled rider sustains himself is illustrated by reference to the experiment of balancing a long pole in a vertical position on the end of the finger. The equilibrium of a pole thus balanced (supposing it to be perfectly so, which it never is) is unstable; but in its almost vertical (or balanced) position the motion of fall is extremely slow; the holder is easily able to detect it, and to move his finger to counteract it. The process for the bicycle is not identical, but analogous; the experienced rider feels the tendency of the vehicle to fall either way, and by an acquired habit, which becomes instinctive, checks it through the guiding wheel, slightly varying his direction. The centrifugal force due to the deflection of his moving velocity thus brought into action counteracts each incipient falling tendency. Perhaps it would be more proper to say that what is, in statics (without motion), a position of unstable equilibrium is made kinetically (*i.e.*, through motion) stable.

Veloc'ity. See ATWOOD'S MACHINE; GRAVITY, LIGHT, etc.

Vel'vet, a rich silk stuff, covered on the outside with a close, short, fine, soft shag or nap. In this fabric the warp is passed over wires so as to make a row of loops which project from the backing, and are thus left, by withdrawing the wire, for an uncut or pile velvet, but are cut with a sharp tool to make a cut velvet. Florence and Genoa have been long noted for the manufacture of velvet, but Lyons, in France, is now its principal seat. Cotton and woolen fabrics woven in this manner are called velveteen and plush, respectively.

Vendée (väṅ-dā'), **La,** department of France; bordering W. on the Bay of Biscay; area, 2,690 sq. m. The coast is either sandy or occupied by salt marshes, from which it has received the name of Marais. The N. part, the Bocage, is more elevated, but the ground is covered either with heath or with pine forest. The rest of the department, the Plaine, is fertile land, suited to agriculture. In spite of all disadvantages, both the Marais and the Bocage are well peopled and carefully cultivated; flax, hemp, and vegetables are produced in the former, honey, fruit, and hops in the latter, and wine in both districts. In the Plaine much wine, wheat, and fruit are produced, and many cattle are fattened for the Paris market. Iron and coal are found. La Vendée is noted for the vigorous resistance offered by its inhabitants to the revolution. Devoted to the Church and the Bourbon monarchy, the peasantry broke out in revolt on March 10, 1793, and, headed by Cathelineau and La Rochejaquelin, were victorious at every point till Kléber and Marceau took the field against them with a large army. At Le Mans they were defeated, and after December, 1793, ceased to be formidable. A second revolt broke out in 1795, but was put down by Hoche. During the Hundred Days they supported the restored Bourbon monarchy, but were held in check by Napoleon's general Lamarque. Pop. (1906) 442,777. Capital, La Roche sur Yon.

Vendémiaire (väṅ-dā-myär'), meaning "vintage"; in the French revolutionary calendar the period from September 23d to October 21st. It was the first month in the revolutionary year.

Vendet'ta, a feud or condition of private war in which the nearest kinsman assumes the duty of avenging an injury to a member of the family. The term originated in Corsica, where it has played an important part in social life. When a murder has been committed, the murderer is pursued not only by the officers of justice, but also by the relatives of the slain, upon whom social duty imposes the obligation of personally revenging his death. If the murderer escapes, the murder may be revenged upon his relatives; and, as the vengeance may be taken whenever an opportunity occurs, the relatives of a murderer whose crime is unavenged have to live in a state of incessant precaution. Similar customs have marked the history of every civilized nation, and are still to be found among the less advanced peoples, such as the Montenegrins, Albanians, Druses, Bedouins, etc.

Vendôme (văñ-dōm′), an ancient countship of France, founded at the end of the tenth century. The most important members follow: CÆSAR (Duke de), 1594–1665; French prince, eldest son of Henry IV by Gabrielle d'Estrées. He was legitimated in his infancy and made Duke of Vendôme. During the reign of his half brother, Louis XIII, he conspired with Chalais against Richelieu (1626), and was incarcerated for four years and banished. After Richelieu's death he was a favorite of the Queen Regent, Anne of Austria, till he took an active part in the Fronde. In 1650, having returned to his allegiance, he was made Governor of Burgundy. In 1653 he took Bordeaux from the Frondeurs, and in 1655, as grand admiral, defeated the Spanish fleet off Barcelona. LOUIS (Duke de), his son, 1612–69, became in 1649 viceroy and commander in Catalonia. He married in 1651 Laura Mancini, Mazarin's niece, on whose death (1657) he became a priest, was made cardinal and papal legate in France. His brother François was the celebrated Duke of Beaufort. LOUIS JOSEPH (Duke de), son of the preceding, 1654–1712. He distinguished himself in Alsace under Turenne and in Flanders under Créqui, and was Governor of Provence, 1681. He became chief commander in Catalonia in 1695, and took Barcelona after a siege in 1697. In the War of the Spanish Succession, as commander against Prince Eugene, he saved himself in 1702 from a disastrous defeat at Luzzara by generalship and intrepidity. After gaining several victories in 1705–6, he became, in 1708, commander in Flanders under the Duke of Burgundy, and was defeated by Eugene and Marlborough at Oudenarde. In 1710 he came to the rescue of Philip V, carrying him back to Madrid, captured at Brihuega an English corps under Stanhope, and won at Villaviciosa, December 10th, a decisive victory over Stahremberg.

Veneer′ing, in cabinetwork, the art of laying thin leaves (usually) of some valuable wood or other material upon a foundation of inferior material. It was known to the Romans, and is referred to by Pliny as a novelty. The plates were formerly sawn by hand, but in 1806 Brunel introduced a method of splitting them from straight-grained wood, and employed circular saws for carved and knotted wood. Veneers of ivory and bone are also used. The finer processes are called marquetry and buhlwork.

Venezue′la, officially ESTADOS UNIDOS DE VENEZUELA, "UNITED STATES OF VENEZUELA," a republic in the N. part of S. America; bounded N. by the Caribbean Sea, NE. by the Atlantic, E. by British Guiana, S. by Brazil, and W. by Colombia; area, 593,943 sq. m. Venezuela is divided into four regions: (1) The mountainous belt of the N. and NW., including the lowlands around Lake Maracaibo; this is the farming zone, and contains five sixths of the civilized population. The highest peak is Sierra Nevada de Merida (15,400 ft.). The region is subject to earthquakes, and has many hot springs. (2) The llanos, a broad belt hardly above sea level, between the mountains and the Orinoco; thinly settled by supporting vast herds of cattle. Swamp fever and dysentery are common in the rainy season. (3) The wooded plains of the SW., with few civilized inhabitants, but rich in rubber and other natural products. (4) The highlands of Venezuelan Guiana, settled only near the Orinoco, with deposits of gold near the frontier, a temperate and healthy climate, and but one town, Angostura, on the Orinoco.

The climate varies greatly; the higher lands are generally temperate and healthy, while the coast and the basin of Lake Maracaibo are among the hottest regions in S. America. The plants and animals resemble the forms found in Brazil. Jaguars, tapirs, various deer, etc., are common, except in the more settled regions. The fisheries of the coast and the Orinoco furnish an important food supply. Formerly the pearl fisheries of Margarita, Cumaná, etc., were celebrated, and the name Pearl Coast survives in many maps. The forest products, but little utilized, include rubber, vanilla, tonka beans, various drugs, and beautiful cabinet woods. The minerals are important. Gold is widely distributed in the highlands, and mines were opened soon after the conquest; at present the principal workings are near Carupano, and especially in Venezuelan Guiana, where the mine called "El Callao" has yielded over $3,000,000 a year. The Aroa copper mines, 70 m. W. of Puerto Cabello, are worked by a British company, and other deposits are reported. Coal of inferior quality is mined near Barcelona. The salt beds of the Araya peninsula have been worked since the sixteenth century. Asphalt is obtained near the Orinoco delta and around Lake Maracaibo. Guano, phosphate rock, jet, kaolin, lead, tin, etc., are reported. The salt mines are a monopoly of the federal government, which controls concessions for all mining enterprises.

Agriculture is the leading industry, but is almost confined to the N. mountainous belt; the principal products are coffee, cacao, and tobacco for exportation, and maize, yucca, sugar, beans, etc., for home consumption. Wheat is cultivated on the higher plateaus. Agricultural methods are usually crude and wasteful. Sheep and goats are largely bred, especially in the NW. districts, whence goat skins (known as Curaçoa kid skins) are exported. The great herds on the llanos have nearly disappeared twice—during the war for independence and in the civil wars of 1858–63—but they are now increasing, and the stock has been improved. Manufactures are almost unknown.

The pop. (1907) was 2,646,835; the civilized, originally of Spanish origin, is mixed with Indian blood, even in the prominent families. The negro element is small, and confined to the coast cities. Civilized or semicivilized Indians maintain separate communities; those of the Goajira peninsula are practically independent. The wild tribes are confined to the upper Orinoco basin. Immigration heretofore has been scanty. As elsewhere in Spanish America, the cultivated and wealthy class is comparatively small. Slavery was abolished peaceably in 1854. Venezuela is composed of thirteen states, a federal district, and five territories dependent on the federal government; formerly there were twenty states. Capital, Caracas (72,429). The government is a federative republic, modeled after that of the U. S.; but the central or state power preponderates, according to the party which is in power, and frequently the presidency degenerates into a dictatorship. The president is elected for four years. Congress consists of two houses. The Roman Catholic is the common and, to a certain extent, the state religion, but other cults are protected. Primary instruction is free and nominally obligatory, but about seventy-five per cent of the population is illiterate. The government maintains a university at Caracas and a smaller one at Merida, several normal and soldiers' schools, academy of fine arts, nautical school, lyceums, seminaries for girls, etc. Caracas has a college of engineers, national library, museum, and observatory. Many Venezuelans finish their education in Europe.

The federal revenue is derived chiefly from import duties. The entire foreign and domestic debt in 1907 was 230,904,012 bolivars, or about $47,000,000, and, as the revenue has frequently exceeded the expenditures (including the service of the debts), this amount could be easily borne. Owing, however, to several defaults and the lack of stability of the government, Venezuelan bonds are generally far below par. The exports (1905–6) amounted to about $16,000,000, and the imports to $9,000,000. Coffee is by far the largest item of export, exceeding $7,000,000; others are cacao, gold, hides and skins, copper ore, tonka beans, dye wood, and rubber. The countries holding most of the trade are England, the U. S., Germany, and France. Much of the coasting and river trade, partly on vessels flying the Venezuelan flag, centers in the British colony of Trinidad. The common roads are generally bad. Steamboats regularly ascend the Orinoco and some of its tributaries. The metric system of weights and measures has been adopted.

The Venezuelan coast was discovered by Columbus, July, 1498, and soon after was frequented by Spanish traders and pearl fishers. Ojeda, observing Indian houses built on piles near Lake Maracaibo, fancifully compared that region to Venice, and called it Venezuela (Little Venice). Las Casas was granted the right to settle Cumaná, but his missionary colony was destroyed by the Indians in 1522. Soon after Charles V farmed out the country to a German commercial house, the Welsers; expeditions sent by them founded Coro (1527), which became the center of exploration. The Indian tribes were destroyed or enslaved during the next forty years; Caracas was founded in 1567. Then Venezuela was much neglected; it was ruled by captains general who, in the eighteenth century, were partly controlled by the viceroys of New Granada. Venezuela was one of the first colonies to revolt from Spain in 1810, and independence was declared, 1811. The movement, of which Miranda became the leader, failed, partly owing to the great earthquake of March 26, 1812, which destroyed Caracas and other cities; the patriots were impoverished, and many, supposing that the disaster was a token of divine wrath, joined the royalists. The war broke out afresh, the colony uniting with New Granada in the republic of Colombia; the principal patriot leader and first president was the Venezuelan Bolivar (*q.v.*), whose victory at Carabobo, June 25, 1821, broke the Spanish power. In 1830, Venezuela seceded from Colombia. Except for transient revolts and a more serious one in 1848–49, the country enjoyed peace until 1859; a civil war then broke out which, after four years, resulted in the overthrow of the government and the accession to power of Falcon and his successor, Guzman Blanco. The boundary with British Guiana has long been a cause of dispute between Venezuela and Great Britain. December 3, 1902, England and Germany, and later Italy, in an attempt to forcibly collect claims, blockaded the ports of Venezuela; the whole matter, through the mediation of the U. S., was submitted to The Hague tribunal.

Venezuela, Gulf of. See MARACAIBO, GULF OF.

Venice (vĕn'ĭs), city of Italy, once the capital of a powerful republic; now the chief town of a province of the same name, on the NW. part of the Adriatic Sea, here called the Gulf of Venice. It is built upon piles upon 118 islets and shoals, streets being replaced by canals, though the islands are connected by bridges, and a railroad runs to the city from the mainland over a viaduct 2¼ m. long. Drinking water is brought from the mainland. Canals, Della Giudecca and San Marco, divide the city proper from the island and suburb of Giudecca and from the island of San Giorgio. The Grand Canal divides the city proper into two parts, and is spanned by two iron bridges erected in 1854 and 1858, and by the Rialto bridge, built of marble by Antonio da Ponte, 1588–91, and called after the largest island (isola del Rialto, from *il rivo alto*, the upper stream). The great canal is lined with magnificent buildings at the water's edge, from which there is immediate access to gondolas. The circumference of the city is 8 m. The finest part is St. Mark's Place, 575 ft. long and 185 to 270 ft. broad, containing the cathedral and the Doge's Palace, bordered by arcades, and surrounded by stately edifices. Many of the churches are remarkable for their splendor and works of art. The most important is St. Mark's, on the E. side of the square, formerly the ducal chapel, but now superseded by San Pietro di Castello as the cathedral. The principal front has 500 marble columns of various shapes and colors. Above the door are the four bronze horses, of Hellenic workmanship, brought from Constantinople in 1204 by Doge Dandolo. The pinnacles and domes produce a finish of exquisite symmetry.

The Doge's Palace contains the magnificent hall of the great council (which now holds the famous library of St. Mark), and that of the formidable Council of Ten. Among its many art treasures is Tintoretto's "Paradise," the largest oil painting in the world. At its top (*sotti piombi*, under the leads), exposed to scorching heat in summer and to cold in winter, languished for a long time political and other prisoners amid excruciating sufferings. The Bridge of Sighs (*ponte dei sospiri*) connects the palace with the public prison. The arsenal and dockyard, at the E. end of the city, was long the most characteristic monument of the great naval power of the republic. The Academy of Fine Arts includes one of the finest Italian picture galleries. The manufactures include glass pearls, beads, etc. (partly made on the island of Murano), brocade tapestry, imitations of antique furniture, lace work (made on the island of Burano), machines, iron and bronze work, and gold and silver ware.

Early in the fifth century the Roman territory of Venetia was invaded by Attila, who destroyed the capital, Aquileia, and burned the other towns, massacring the inhabitants. Fugitives settled on the islands in the lagoons and the Gulf of Venice. They were practically independent, and were governed at first by three elected consuls, and afterwards by twelve tribunes. The islands became involved in intestine quarrels, for which a remedy was sought in a single governing head; and, in 697, Paolo Luca Anafesto was chosen the first doge (duke). The families of the deposed tribunes became an aristocracy. The seat of government was permanently fixed in 810 on the island of Rialto, which became a center of trade. In 829, according to tradition, the bones of St. Mark were transferred from Alexandria to Venice. He became the patron saint, and Venice was styled the "Republic of St. Mark." Previous to the first crusade the republic had acquired territory on the mainland of Italy and in Dalmatia, Croatia, and Istria, and held most of the carrying trade of the world. In 1098 she sent a great fleet to aid Godfrey of Bouillon. She joined the Lombard league against the German emperor, and in 1177 gained a victory in defense of Pope Alexander III over Otho, son of Frederick Barbarossa. The pope rewarded the doge Ziani with a ring for performing the ceremony of "marrying the Adriatic," and Frederick was forced to make peace at a congress in Venice.

In 1202 the soldiers of the fourth crusade gathered here, assisted in suppressing an insurrection in Dalmatia, and then under the lead of the doge Enrico Dandolo stormed Constantinople. The fairest portion of the Eastern Empire, including parts of the Peloponnesus, Crete, Eubœa, and other islands, now fell under the sway of Venice. In 1289 the Inquisition was established, subject to a civil power. After minor conflicts with Genoa, a serious war broke out on the occupation of Constantinople by the Palæologi with Genoese aid (1261); and until near the end of the fourteenth century the two republics were often engaged in desperate struggles, and Venice was once brought to the verge of ruin. Venice had by gradual changes become an oligarchy, and the system was completed by the introduction of the hereditary nobility and its golden book, and the establishment of the Council of Ten, supreme in power, irresponsible, and judges of the doge himself. Among the internal convulsions during this period, the conspiracy and execution of the doge Marino Falieri in 1355 is chiefly remarkable. Venice soon recuperated, and on the doge Mocenigo's death in 1423 she had reached the climax of her prosperity. During her struggles with Genoa she made herself mistress of Treviso and other territories on the Italian mainland, and, after the Peace of 1381, also of Vicenza, Verona, and Padua. Under Mocenigo's successor, Francesco Foscari, she was engaged for about thirty years in mostly successful wars with the dukes of Milan, and for the remainder of the century with the Turks, with whom a disadvantageous peace was concluded in 1503. Venice then had a population of 200,000.

During the sixteenth and seventeenth centuries Venice was repeatedly engaged in war both for and against nearly every European power. A portion of her Grecian possessions was taken by the Turks in a war which ended in 1540, and Candia, after a long struggle, in 1669; and in 1715 her last hold on the Morea was lost. The discovery of America and of the passage around the Cape of Good Hope had in the meanwhile diverted commerce from Venice. She finally lost her national independence after the French occupation in 1797, and by the Peace of Campo Formio, Venice, with a large part of her territories, was surrendered by Bonaparte to Austria. By the Peace of Pressburg, 1805, she was annexed to the Kingdom of Italy. After the fall of Bonaparte she was restored to Austria as part of the Lombardo-Venetian Kingdom. In 1848, Venice revolted against the Austrians, and under the lead of Manin proclaimed the republic; but, after a long siege and a terrible bombardment, she capitulated, 1849, and remained in a state of siege until 1854. After the Austro-Prussian War of 1866, Venice and all Venetia were ceded by Austria to Napoleon III, who transferred the government to the municipal authorities; and in October, out of over 650,000 votes cast, all but sixty-nine were in favor of annexation to the Italian Kingdom. Pop. (1901) 151,840.

Venire facias (vē-nī'rē fā'shĭ-ăs), or simply Venire, an ancient common-law judicial writ directed to the sheriff, commanding him to select and cause to come (*venire facias* is Latin for "cause to come") before the court a number of qualified citizens to act as the jurors at such court.

Ventila'tion. See Warming and Ventilation.

Ven'tricles. See Heart.

Ventril'oquism, literally, one who (apparently) speaks from the belly; the art of so managing the voice as to cause the illusion that its origin is from some other source than the vocal organs of the speaker. It was known to the ancients, and was prohibited by the law of Moses. Practice is all that is needed to acquire this art. The words uttered by the ventriloquist are formed in precisely the same manner as in ordinary speech, the difference consisting mainly in the mode of respiration. A very full inspiration is taken, and then the air is expired slowly through a narrowed glottis, the diaphragm being kept in its depressed condition and the thoracic muscles alone being used to empty the lungs. At the same time the lips are scarcely moved, and the deception is still further facilitated by the attention of the auditors being directed to the object which the performer wishes to be regarded as the source of the voice.

Ventu'ra, capital of Ventura Co., Cal.; on the Pacific, 60 m. WNW. of Los Angeles; legal name derived from a famous old Spanish mission; noted as a shipping point for fruit and beans; principal industries, agriculture and fruit growing; equable climate and hot springs have made it a popular resort for invalids. Pop. (1907) 17,374.

Ven'ue, originally the neighborhood or place where the facts which form the basis of a law suit are alleged to have occurred, and from which, therefore, the jury was to come that should try the issue. In the later meaning of the term, and the one which it now has, it denotes the county or jurisdiction in which a cause is to be tried.

Ve'nus, in Roman mythology, the goddess of love, especially of sensual love. The Romans identified her with the Greek Aphrodite, and adopted all the myths relating to that goddess. Aphrodite was among the Greeks one of the great Olympian divinities and the goddess of love and beauty. They represented her as having sprung from the foam of the sea. She first landed at Cythera, and thence went to Cyprus. These two islands were the principal seats of her worship, and from them she was called the Cytherean, Paphian, and Cyprian Aphrodite. She was married to Hephæstus (Vulcan), the ugliest of the gods, but had many amours both with other gods, especially Mars, and with mortals. Of special Roman interest was her adventure with Anchises, to whom she bore Æneas, the founder of Rome. The planet Venus and the month of April were sacred to her. Venus was a favorite subject of ancient sculpture. The statues known as the Venus de' Medici and the Venus of Milo are among the most celebrated works that have been preserved from antiquity. The former, exhumed in the seventeenth century in eleven pieces, is in Florence; the latter, found in the island of Milo in 1820, is in the Louvre, in Paris.

Venus (named from the Roman goddess Venus), the second planet in order of distance from the sun, and the next neighbor of the earth within its orbit. Venus travels at a mean distance from the sun of about 67,000,000 m. Venus when nearest to the earth, at a distance of about 25,000,000 m., is invisible, being lost in the sun's rays. According to the position it occupies, Venus has phases, like the moon, appearing as a thin crescent which gradually increases to full phase and then decreases. Venus completes a revolution round the sun in 224.7008 days, and has a rotation period of about twenty-three hours. Venus is sometimes called the morning star, or the evening star, because it is so bright that on moonless nights its light casts a shadow. It has a diameter of about 7,650 m., and its density is slightly less than the earth's. Some astronomers claim to have seen spots and markings upon the surface of Venus; but the best observers, using the most powerful telescopes, have uniformly failed to see what inferior observers have imagined they have discerned with relatively imperfect instruments. Sir John Herschel remarks that "the surface of Venus is not mottled over with permanent spots like the moon; we perceive in it neither mountains nor shadows, but a uniform brightness, in which we may indeed fancy obscurer portions, but can seldom or never rest fully satisfied of the fact." It has been asserted that Venus always presents the same face to the sun, just as the moon does to the earth.

Venus, like Mercury, crosses the face of the sun, but at longer intervals. Its transits are more important than those of Mercury, because, being nearer to us when in transit, its position on the sun is different for observers differently placed on the earth. The following are the dates of these transits during seven centuries:

1631, Dec. 7.
1639, Dec. 4.
1761, June 5.
1769, June 3.
1874, Dec. 9.
1882, Dec. 6.

2004, June 8.
2012, June 6.
2117, Dec. 11.
2125, Dec. 8.
2247, June 11.
2255, June 9.

Venusberg (vă'nôs-bĕrkh). See TANNHÄUSER.

Ve'nus's Flow'er-basket, the *Euplectella speciosa*, a flinty sponge found near the Philippines, consisting of a delicate lacelike skeleton or framework, which, when the animal tissue is removed, forms a cornucopia 12 or 15 in. high and 2 in. wide.

Venus's Fly'-trap. See DIONÆA.

Venus's Gir'dle. See GIRDLE OF VENUS.

Vera Cruz (vă'rä krōz), the leading port of Mexico, about 180 m. E. of Mexico City. The harbor has been improved by a breakwater. The city is built on flat and barren land, and it has no notable buildings. The climate is unpleasantly warm. Vera Cruz is the oldest Spanish settlement in Mexico, having been the landing place of Cortez when he began the conquest, and the fort of San Juan de Ulûa, fronting the city, was the last post held by the Spaniards in continental N. America, as it was surrendered November 18, 1825. Vera Cruz was taken by the Americans in March, 1847; was taken by the French in 1861 and has repeatedly figured in civil struggles. Pop. (1900) 29,164.

Vera'trum, a genus of plants of the lily family. *Veratrum viride*, or American hellebore, called also Indian poke, poke root, swamp hellebore, grows in damp soil from Canada to the Carolinas. The root stock is used in medicine, its activity residing in two alkaloids, *jervine* and *veratroidine*. It is a powerful drug, lowering the force and frequency of the heart beats and respirations, and having a strong tendency to produce nausea and vomiting, with muscular weakness and relaxation. In overdose it produces alarming prostration and feebleness of the heart, but from the prompt vomiting which large doses occasion, cases of fatal poisoning are rare. There is no antidote to the poison, and after evacuation of the dose from the stomach, perfect rest and the use of restoratives such as alcoholics, ammonia, artificial respiration, etc., constitute the treatment.

Verazzano, or **Verrazano** (vĕr-rā-tsä'nō), **Giovanni da,** 1480–1527; Italian navigator; b. near Florence, of a noble family; traveled in Egypt and Syria, engaged in traffic in spices, silks, etc., and entered the French maritime service about 1505; made a voyage to the E. Indies, 1517, in a Portuguese vessel; employed as a corsair or privateer by the French Govt. in 1521 and the following years; took many prizes of Spanish vessels returning from the W. Indies; captured, 1523, the treasure ship in which Cortes had sent from Mexico to Charles V a large portion of the personal spoils of Montezuma, valued at $1,500,000. Sailed, 1524, on a voyage of exploration to N. America; discovered land at a point near Cape Fear and a bay, either that of New York or Narragansett Bay. On one of his voyages was captured on the S. coast of Spain, and executed as a pirate.

Verb (vėrb), that part of speech which commonly serves to denote what is stated about the subject, or expresses an assertion. By means of tenses and moods, verbs indicate time and mode. A substantive verb forms the copula or joining word of a proposition, as "God *is* great"; a common or adjective verb can form both the copula and the predicate of a proposition, as "the sun *shines*," or "*is shining*." Verbs are transitive if they require an object, as "care killed the cat," in which cat is the object. The subject may also be the object or complement, as "she dressed herself." An intransitive verb expresses a complete idea without an object, as "she sleeps," "he runs." Verbs have three persons—first, second, and third: I am, you are, he is; and two numbers, singular and plural. The tense of a verb expresses its relation to time. English verbs have six primary tenses: (1) Present tense: I write (simple form), I am writing (progressive form), I do write (emphatic form). (2) Past, or preterit: I wrote, I was writing, I did write. (3) Future: I shall write, I shall be writing. (4) Present perfect, denotes past time completed in the present, as: I have written a letter, I have been waiting for a week. (5) Past perfect, denotes past time that precedes some other past time: He had left before they came. (6) Future perfect, denotes future time that precedes some other future time: I shall have finished before you start. The moods or modes of a verb indicate the manner in which it is asserted of the subject.

The indicative mood expresses direct assertion: "He goes." The subjunctive expresses conditional assertion: "If he *were* here." The potential implies possibility: "He can write." The imperative expresses a command: "Stop!" "Let us march!" The infinitive expresses existence in general, as "to love," "to hear." A participle is a verbal adjective, but expressing the idea of time, the present participle as "loving," the past as "loved." Auxiliary or helping verbs are followed by other verbs, as "he *shall* go," "she *must* come." Verbs are regular or irregular. In English an irregular verb is one that does not form its preterit and past participle by adding *d* or *ed*, as "drink, drank," "grow, grew." A reflective verb is followed by a reflective pronoun, as "to honor oneself." An impersonal verb describes an event without stating the agency causing it, as "it rains," "it is cold." Voice expresses the relation which the action bears to the subject, as: The man washes (active voice), I wash the clothes (middle voice), the boy is washed (passive voice).

Verbe'na Fam'ily, a group of 740 species of herbs, shrubs, and trees mainly of the tropics and S. Temperate Zone, nearly related to the mints (*Labiateæ*). About forty species are natives of N. America. S. American species of verbena are ornamental plants, as are also the lemon verbena, or lemon grass of Chile, from which the perfume "oil of verbena" is extracted, and others. The teak tree of India and species in New Zealand are large and valuable timber trees. Some of the wild species of verbena were used as domestic medicines and in love philters and charms under the name of vervain.

Vercinget'orix, Gaulish chief who, in 52 B.C., rebelled against Cæsar. At first successful, he was taken at Alesea, and, after having adorned Cæsar's triumph (45), he was executed.

Verd Antique (vėrd ăn-tēk'), or **Verde Anti'co,** a fine green stone mottled with white and brown; greatly esteemed for decorative work. It is a kind of serpentine. Five specimens of it have been found among the ruins of Roman buildings, or have been taken from their walls to be used in modern structures. Green marbles and other stones of good green color and taking a polish have been called by this name. A stone quarried at Roxbury, Vt., and a marble at Milford, Pa., are both sold as verd antique.

Verdi (vār'dē), **Giuseppe,** 1813–1901; Italian composer; b. Roncole, Italy; received his first lessons in music from the organist of the village church; attracted the attention of an amateur musician, who sent him to Milan, where, 1833, he studied under Lavigna, head of the Scala Theater. Verdi's first opera was "Oberto, conte di San Bonifazio," produced in Milan November 17, 1839. He afterwards composed about twenty-six operas, the best known of which are "Il Trovatore," "La Traviata," "Rigoletto," "Ballo in Maschera," "Aïda," "Otello," and "Falstaff." One large work for the Church should also be mentioned—a "Grand Requiem Mass." A large number of his works have been received with enthusiasm in all civilized lands. An additional proof of his talent was the fact that the quality of his work did not fall off during the long period of his professional activity, but kept pace with the great changes that affected the dramatic stage.

Ver'dict, in law, the decision rendered by a jury according to law, as to the matters in issue submitted to them, in respect of which they have been sworn to find and declare the truth. In Scotland a form of special verdict in criminal cases is that of "not proven," which does not acquit the prisoner, but does protect him from a second trial for the same offense. A verdict to be valid must be unanimous. If the jury agree upon their verdict after the adjournment of the court for the day, they are permitted to reduce it to writing, sign, and seal it up, and then separate; or they may be directed by the court to render a sealed verdict.

Verdigris (vėr'dĭ-grēs). See ACETATES.

Vere (vēr), **Aubrey Thomas de,** 1814–1902; Irish author; son of Sir Aubrey Hunt de Vere; b. Curragh Chase, Ireland; educated in Trinity College, Dublin. He became a Roman Catholic in 1851, and much of his poetry was religious in character. He was an intimate friend and connection by marriage of Sir Henry Taylor. Among his published works are "The Waldenses," "The Search After Proserpine, and Other Poems," "English Misrule and Irish Misdeeds," "Picturesque Sketches of Greece and Turkey," "The Church Settlement of Ireland, or Hibernia Pacanda" (1866), "Irish Odes, and Other Poems" (1869), "The Legends of St. Patrick" (1872), "Alexander the Great, a Dramatic Poem," "Saint Thomas of Canterbury," "Legends of the Saxon Saints" (1879), "The Foray of Queen Meane" (1882), "Essays Chiefly on Poetry," "Essays Chiefly Literary and Ethical," "Religious Poems of the Nineteenth Century."

Verestchagin (vă-ră-shă-gēn'), **Vasiliĭ,** 1842–1904; Russian genre and military painter; b. Tcherepovets, Russia; studied at St. Petersburg Academy and under Gérôme in Paris; traveled in the East, and painted in India and Turkestan; served with the Russian army in Turkestan and during the Russo-Turkish War, and was severely wounded; painted a series of pictures representing battles and episodes of that campaign. Was in Cuba during the Spanish-American War. His works, many of which are of immense size, have been called realistic by some critics, and by the exhibition of his pictures in a complete collection in the principal cities of Europe and in the U. S. his name has become widely known. He went on the Russian battleship *Petropavlosk* to paint naval war scenes, but was drowned when that ship was sunk off Port Arthur by the Japanese.

Ver'gil. See VIRGIL.

Vergin'ia, a Roman maiden. See VIRGINIA.

Vergniaud (vĕr-nyĕ-ō'), **Pierre Victurnien,** 1759–93; French revolutionist. He was a prominent advocate at Bordeaux; elected to the Legislative Assembly, 1791; its president, October 31st; promoted the republic, 1792; and elected to the convention. From the conviction of the king until the arrest of the Girondists (June 2, 1793), of whom he was the most eloquent leader, he was continuously combating Robespierre and the *montagnards.* Before the revolutionary tribunal, October 24th, he made a spirited defense, but, with his colleagues, was guillotined.

Verjuice (vėr'jūs), the acid or sour juice of unripe grapes, formerly used in Europe as a beverage and an astringent in medicine. The term also includes the fermented juice of crab apples, used for flavoring in cooking, as for sauces, called also agresta and omphacium.

Verlaine (vĕr-lān'), **Paul,** 1844–96; French poet; b. Metz, Lorraine; devoted himself to letters, and early distinguished himself among the young poets who, starting from the Parnassiens, separated themselves consciously from them in search of novelty of form and profundity of meaning, and have been called Symbolistes and Décadents. He was regarded by them with great admiration, and exercised a real influence upon French poetry. He lived a bohemian life, with frequent stays in hospital and jail, and embodied his experiences in his poetry. Among his works are "Poèmes saturniens," "Fêtes gallantes," "La bonne Chanson," "Romances sans Paroles," "Amour," "Parallèlement," "Chansons pour Elle."

Vermejo (vĕr-mā'hō), **Berme'jo,** or **Ri'o Gran'de,** river of S. America; rises in S. Bolivia, flows SE. to the Paraguay. Its course is tortuous—estimated at over 800 m.—and its navigability is poor.

Vermes (vėr'mēz). See WORMS.

Vermicelli (vėr-mē-chĕl'lĭ). See MACARONI.

Ver'miform Appen'dix, a slender, hollow, blind process occupying the lower right side of the abdominal cavity of man and some other mammals. It is the undeveloped terminal portion of the cecum, from which it projects; the end is free, and may point in any direction. It has no known function. See APPENDICITIS.

Vermifuge (vėr'mĭ-fūj), medicine or substance to expel worms from the stomach and intestines. See ANTHELMINTICS.

Vermil'ion. See CINNABAR.

Vermont', one of the U. S. of N. America; the first state admitted into the Union after the adoption of the Federal Constitution by the original states; popularly known as the GREEN MOUNTAIN STATE; capital, Montpelier. It is bounded N. by the province of Quebec, E. by New Hampshire, S. by Massachusetts, W. by New York; extreme width, 90 m.; minimum width, 41 m.; extreme length, 158 m.; area, 9,565 sq. m. Pop. (1910) est. at 365,000.

The surface is irregular and broken; mountains, valleys, lakes, rivers, hills, cliffs, plains, and meadows combine to produce varied and beautiful scenery. The N. portion, where the main range of the Green Mountains is reënforced by parallel ranges, is more rugged than the S., but nowhere are there large plains. The highest point of the range is the so-called Chin on Mt. Mansfield (4,389 ft.). Other peaks are Camel's Hump, 4,188; Killington, 4,380; Mansfield Nose, 4,071; Lincoln, 4,024; Jay Peak, 3,861; Equinox, 3,847; and Ascutney, 3,300; and many summits over 3,000 ft. The mountains are for the most part covered with dense forests of evergreens, chiefly spruces. The drainage of the state is chiefly from the mountains E. and W. The Missisquoi, Lamoille, Winooski, Otter, and Poultney rivers flow into Lake Champlain; the Mulhegan, Passumpsic, Wells, Ompompanoosuc, White, Queeche, Black, Williams, West, and Deerfield into the Connecticut; the Clyde, Barton, and Black into Lake Memphremagog; and the Battenkill and Hoosac into the Hudson. Lake Champlain is 126 m. long, with width of 13 m. The islands—Grand Isle, North Hero, Isle la Motte, with the Alburgh peninsula—form one of the counties. About three fourths of this lake and one fourth of Memphremagog are in Vermont. Of the lakes wholly within the state the principal are Bomoseen, Willoughby, Salem, Seymour, Dunmore, and Groton.

Although much of the soil is stony and sterile, there is some that is productive, and the average yield of many crops to the acre is greater than the average for the U. S. The state is an agricultural one, and the most important agricultural interest is that of dairying. Along the shores and on the larger islands of Lake Champlain there are large apple and pear orchards. The sugar maple grows in most parts of the state, and furnishes one of the industries. The farms are comparatively small, and since the development of the Mississippi valley has made competition in wheat impossible to New England, Vermont has adopted methods of intensive farming; and corn is largely raised. The forests are largely of spruce and fir, with hemlock and pine on the lower slopes. The hillsides bear groves of maple, beech, and birch (white, black, and yellow), and on the lowlands are walnut, ash, several species of oak, butternut, poplar, and elm. In all there are some fifty species of native trees and twice as many of large shrubs, with about 1,300 species of herb plants. On the higher mountains are found Arctic plants, such as *Saxifraga aizoon*, while on the sandy shores of Lake Champlain are sundry plant reminders of ancient days when the water was salt. The general flora shows a mingling of Canadian, S., and W. species. The larger wild animals formerly common have either disappeared or become rare. The panther, black bear, deer, and otter are occasionally found, and the raccoon, mink, muskrat, porcupine, skunk, woodchuck, squirrels, etc., are more or less common. Among birds there are the golden and the white-headed eagle, the former rare, the latter common in the lake region; many hawks, owls, ducks, and other water birds, besides song birds. The waters of the larger lakes and streams supply many fish, such as trout, muskalonge, pike, bass, pickerel, whitefish, sturgeon, etc.

The rocks of Vermont constitute an important part of its wealth. There are about 170 quarries, from which great quantities of marble, granite, slate, and soapstone are obtained. More than two thirds of all the marble quarried in the U. S. is taken from these quarries. Most of this is found in Rutland and Addison cos., the principal quarries being at Dorset, W. Rutland, Proctor, Pittsford, Middlebury, and Brandon. The marble from these quarries varies from the purest statuary to almost black. There are quarries of serpentine, verd antique, etc., but these are worked only to a limited extent. Excellent granite is found in many localities, and the quarries are becoming more numerous. The principal quarries are at Barre, Ryegate, Hardwick, and Brunswick. Roofing slate is quarried at Castleton, Fair Haven, and Northfield. Soapstone is quarried at Athens, Perkinsville, Cambridgeport, and elsewhere. Vermont is not rich in mines. The largest ones are in Corinth and Vershire, where for many years chalcopyrite has been mined for copper. Gold, silver, lead, iron, and manganese are found in limited quantities. Many minerals of interest to the scientist, though of little commercial value, are found, such as talc, chrysoprase, tourmaline, cyanite, garnet, etc. The climate is variable and liable to sudden changes. The N. and E. portions are colder than the W. At Burlington the mean annual temperature is 45° F. The highest temperature is seldom above 80° F., the lowest not often below −15° F., though there are days in which the thermometer exceeds these limits. Lake Champlain usually freezes over.

For administrative purposes Vermont is divided into fourteen counties.

Principal cities and villages: Burlington, Rutland, Barre, Montpelier, St. Albans, St. Johnsbury, Bennington, Brattleboro, Bellows Falls, Winooski, Fair Haven, Springfield, and Proctor. In 1905 there were in operation 1,699 factories, with a capital of $62,658,741, producing goods of the value of $63,083,611. Some of these, as the scale works in St. Johnsbury, the organ works in Brattleboro, the scale works in Rutland, and the agricultural-implement works in Bellows Falls, are very extensive. Aside from the quarry and dairy products, the principal articles made are woolens, cotton, leather, paper, furniture, lumber, and drugs. The mountain streams are being largely used for power. A commerce of considerable importance is carried on through Lake Champlain, and there is also a large traffic with Canada.

As early as 1761 land was set apart for educational purposes. The town system of common schools has been adopted since 1870. The higher institutions include the state university, Middlebury College, and Norwich Univ. Most of the charitable institutions are near Burlington; they include the Mary Fletcher Hospital, a home for destitute children, the Providence Orphan Asylum, the Howard Mission House, the Adams Mission Home, the Cancer Relief Association, the Home for Aged Women, the Home for Friendless Women, a Young Men's Christian Association, besides private retreats and hospitals. At Bennington is a soldiers' home. The state prison is at Windsor.

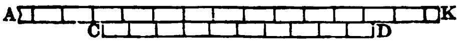
Since 1870 the state officers and legislature have been elected biennially. The senate is composed of thirty members, apportioned among the counties according to population, and the house of one representative from each town without regard to population, there being in all 246. State elections are held in September in even years. The judiciary is elective throughout, the chief justice and six assistant justices of the supreme court being elected by the legislature in joint session; the assistant judges of the county courts by popular vote in the counties; and justices of the peace by popular vote in the towns.

Champlain discovered the lake which bears his name in 1609, and was probably the first man to enter the region. For many years the territory of Vermont was not occupied by villages, but was a battlefield and hunting ground traversed by wandering parties of Iroquois or Algonkins, and later by armed bands of French or English. As all the Indian names of lakes, streams, etc., are Algonkin, it seems probable that these people held original possession. Fort St. Anne, on Isle la Motte, was built by the French in 1665, and was the first white settlement, though not permanent. Fort Dummer, near what is now Brattleboro, in 1724, was probably the first English settlement. Bennington was settled in 1761 on land granted in 1749 by Gov. Wentworth, of New Hampshire, and in 1762 a few families settled in Newbury. Gov. Wentworth claimed the whole territory as a part of New Hampshire, and 138 townships were deeded by him in the "New Hampshire Grants." Trouble arose when the Governor of New York also claimed jurisdiction under letters from Charles II. Proclamations and counter-proclamations were issued, but the settlers, most of whom had paid the Governor of New Hampshire for their titles, sided with Gov. Wentworth and resisted the claims of New York; the quarrel was continued many years by the "Green Mountain Boys," as the Vermont militia was called. In 1776 the people of the New Hampshire Grants applied to the Federal Congress for admission as a state, but through the influence of New York they were refused. They then formed an independent republic, at first called New Connecticut, but later Vermont. As an independent state Vermont continued thirteen years. Finally, after again being refused in 1789, Vermont was received as the fourteenth state, and the first under the Federal Constitution, in 1791. Notwithstanding the exclusive policy of the other states, Vermonters bore their full share of hardships, losses, and expenses of the War of the Revolution. The state took active part in the War of 1812. In the war of 1861–65 Vermont did more than its share. In proportion to the population its loss in hospital and on battlefield was larger than that of any other N. state; it furnished 1,500 more men than were called for; its money contribution amounted to over twelve per cent of the total property valuation; and out of a population of 315,098 it sent 33,288, or more than one tenth of the entire population.

Verne (vĕrn), **Jules**, 1828–1905; French author; b. Nantes, France; studied law, and made his début in literature in 1850 with a comedy in verse, "Broken Straws"; wrote subsequently several other plays, and began in 1863, with his "Cinq Semaines en Ballon," the vein of surprising adventures based more or less plausibly upon facts of science, which he pursued with great success. His most popular work is the "Around the World in Eighty Days," which was dramatized. He also wrote "Journey to the Center of the Earth," "Twenty Thousand Leagues Under the Sea," "From the Earth to the Moon," "Dr. Ox's Experiment," an illustrated geography of France, "Michel Strogoff," "Green Ray," "Christopher Columbus," "The Star of the South," "The Castle in the Carpathians," "The Giant Raft," etc. Most of his works have been translated into English and other languages.

Vernet (vĕr-nā'), **Émile Jean Horace**, generally called Horace Vernet, 1789–1863; French painter; b. Paris, of an artist family. It was intended that he should study painting, but he failed to obtain the prize and became a conscript; served in the army; married, and began to paint battle pictures according to his own ideas. In 1810 he exhibited "The Capture of a Redoubt"; in 1811, "The Dog of the Regiment" and "The Halt of French Soldiers"; in 1812, "The Taking of an Intrenched Camp." The impression that these pictures produced was extraordinary. Instead of the conventional manner, Vernet painted war scenes and soldiers as he had seen them himself, and through engravings and the newly invented art of lithography his enthusiastic representations of the grand army and its exploits—"The Death of Poniatowski," "The Bridge of Arcola," "The Soldier of Waterloo," etc.—passed into the hands of the humblest Frenchmen. In 1822 his pictures were refused admittance by the Academy on account of their Bonapartist tendency, but Vernet opened a private exhibition. Charles X sent him in 1827 to Rome as director of the French school there. His relations with Louis Philippe became friendly. Vernet resided in Algeria 1833–35. He continued to paint Napoleon—the battles of Jena, Friedland, Wagram, etc.—but from 1836 to his death he chiefly treated subjects of the Algerian campaigns. Besides battle pieces, he painted a number of pictures, half genre and half historical, such as "Rebecca at the Well," "The School of Raphael," "The Lion Hunt," etc., and portraits, among which were those of Napoleon I, of Louis Philippe, and of Napoleon III.

Vernier (vĕr'nĭ-ĕr), named for the inventor, Pierre Vernier, an instrument for measuring a fractional part of one of the equal divisions of a graduated scale or arc. It consists of an auxiliary graduated scale, the divisions of which differ from those of the primary scale. The vernier scale is formed by taking a space equal to an exact number of parts of the primary scale, and dividing it into a number of equal parts, either greater by 1 or less by 1 than the number that it covers on the primary scale. Let A K be a scale of equal parts, and let each part represent 1 ft.; let C D be a parallel scale, such that it is exactly equal to nine parts of the primary scale; suppose C D to be divided into ten equal parts; then each part will represent .9 of 1 ft. By means of these scales one can measure distances to within .1 of 1 ft. Suppose the 0 of the vernier in the first instance to coincide with the division 17 of the primary scale; then the distance from the 0 of the scale to the 0 of the vernier is exactly 17 ft. If we suppose the vernier to slide along the primary scale till the division 1 coincides with 18, the distance from the 0 of the scale to the 0 of the vernier will be equal to 17.1; if it slides along till the division 2 coincides with 19, the distance between the 0 of the scale and the 0 of the vernier is 17.2, and so on.



To read an instrument by means of a vernier: Read the principal scale up to the last division preceding the 0 of the vernier, and call the result the reading on the limb; then look along the vernier for the division that coincides most nearly with a space on the limb, and multiply the number of that division by the least count; this result is called the reading on the vernier; the sum of the two readings will be the true reading of the instrument.

Ver'non, Edward, 1684–1757; English admiral. He attained the rank of rear admiral in 1708, and remained in active service till 1727, when he was elected to Parliament, gained great popularity by condemning the ministry, and was many times reëlected. In November, 1739, he captured Porto Bello, and in 1741, he sailed against Cartegena, but was repulsed with loss. Smollett and Lawrence Washington (elder brother of George) were in this expedition. The former described it in "Roderick Random"; the latter, to honor the admiral, named the Washington home Mt. Vernon. During the invasion of the Pretender, in 1745, he was employed to guard the coast of Kent and Sussex; but on account of a quarrel with the admiralty his name was struck from the list of admirals.

Vero'na, capital of province of Verona, Italy. It is situated at the base of the Alps, 72 m. W. of Venice, in a fertile plain, and is divided by the Adige into two parts, which are connected by six bridges. As a fortress Verona constitutes, with Peschiera, Mantua, and Legnano, the historically famous Quadrilateral, and is the key to the Tyrol from the S. It is surrounded by forts. Trade in grain, hides, flax, hemp, marble, silk, velvet, linen, and woolens is carried on. There are flourishing institutions for science and art, a public library with MS. collection, a picture gallery (mostly of old Veronese masters), an agricultural academy (1768), a botanical garden, good colleges, and a private institute for poor girls. Of the many interesting buildings, the chief is the old Roman amphitheater (Arena), built between 81 and 117 A.D., and well preserved, with a seating capacity of 60,000. There are forty-eight churches, some of them with beautiful works of art, besides a cathedral of the twelfth century. The ancient Basilica of S. Zeno and the Dominican Church of S. Anastasia, in semi-Gothic style, contain early examples of painting and sculpture. Near the old Friar Monastery the so-called tomb of Shakespeare's Juliet is shown. Verona became a Roman colony with the title of Augusta in 89 B.C., was the birthplace of Catullus, and probably of Cornelius Nepos; was of great importance during the Gothic-Longobardian times, especially as the residence of the Ostrogoth Theodoric, the celebrated Dietrich von Bern (*i.e.*, Verona) of the Germanic saga. It passed from Milanese into Venetian hands; became Austrian in 1814 and Italian in 1866. Pop. (1907) 74,271.

Verona, Con'gress of, a meeting of the European powers in 1822 to take action upon the revolution in Spain, where the Bourbon king, Ferdinand VII, had been forced to sign the constitution of 1812 and was at the mercy of the radicals. As at Laibach, the spirit of the congress was reactionary, and, true to the principles of the Holy Alliance (*q.v.*), its members favored intervention on behalf of the Spanish sovereign. The Czar hoped to be the agent to carry out the decree of the congress, but abandoned the project on learning that France would not permit the passage of Russian troops through her territory. The protest of Great Britain, through her envoy, Wellington, prevented the congress from taking formal action against the Spanish revolutionists, but it could not prevent the consent of the powers to the intervention of France as the power chiefly endangered by the revolution. As a result of the congress the Duc d'Angoulême invaded Spain at the head of a large army in 1823, and the despotism of the Bourbons was fully restored.

Veronese (vā-rō-nā'zā), **Paul,** properly PAOLO CAGLIARI, abt. 1530–88; Italian painter. He studied in Verona and Rome, and became one of the greatest masters of the Venetian school. He was distinguished for the freedom and boldness of his designs, the brilliant coloring of his costumes and accessories, and his wonderful facility. The grandest of his celebrated festive meetings is "The Marriage in Cana," 30 ft. by 20, in the Louvre. The three pictures representing St. Sebastian's death, in Venice, rank highest among his religious works, and "Venice Crowned by Fame," on the ceiling of the great council hall, is renowned among his allegorical pieces. His productions were almost innumerable. The British National Gallery has his "Darius's Family Brought Before Alexander," in which the men and women are Venetians with accessories of the sixteenth century. The same disregard of history is conspicuous in his other works. But his composition, in line and mass, and also in color, is perfectly easy, natural, and spontaneous. His design is also peculiarly attractive, his men and women are splendid beings, almost more than human in their health and power and stately grace, his costumes are superb, his architectural backgrounds unequaled in painting. He could draw anything with equal ease, and knew as well as any painter who ever lived how to make one touch or one tint do the work of many.

Veron'ica, the name given in Christian legend to the woman whose issue of blood was cured by Jesus (Matt. ix, 20), and who afterwards saw Him pass to His crucifixion, and gave Him her handkerchief that He might wipe His brow. He accepted the kindness, and returned the cloth with the impress of His face upon it. The cloth was endowed with curative properties, and wrought many miracles. By order of the emperor Tiberius, Veronica went to Rome to cure him of leprosy, and prevailed upon him to exile Pilate. She gave the cloth in her will to Clement, the successor of Peter, and it is now preserved in St. Peter's and exhibited at intervals. In the Middle Ages it became the fashion to call the cloth " Veronica." In other forms of the legend she is the niece of Herod, is known as Berenice, and again is an Antiochene martyr. Perhaps the source of the legend is in the story that Jesus sent Abgarus of Edessa his *vera icon*, his true likeness.

Ver'res, Caius, d. 43 B.C.; Roman Governor of Sicily. He was proquæstor to Dolabella, prætor of Cilicia, 80–79, and participated in his iniquitous acts, but afterwards turned against him and contributed to his conviction. With the money obtained by plundering the provinces, he was elected prætor in 74, and became by lot *prætor urbanus*. Next he obtained for three years the administration of Sicily, then the wealthiest province of the republic, which he desolated by his rapacity. The Sicilians intrusted to Cicero the prosecution of Verres, who was defended by Hortensius and supported by the Scipios and the Metelli. The efforts to secure his acquittal were fruitless, and before the expiration of the nine days which were given to the hearing of evidence he fled to Massilia, where he remained in exile twenty-seven years. He was put to death by the proscription of Antony.

Verroc'chio, Andrea del, 1435–88; Italian sculptor and painter; b. Florence. He was a pupil of Donatello and Pollainolo; his first important work was the marble basin still existing in the sacristy of S. Lorenzo; is said to have cast the bronze doors modeled by Luca della Robbia for S. Lorenzo. He also cast the bronze ball that Brunelleschi designed for the dome of the Cathedral of Florence. The tomb of Francesca Tornabuoni, executed in Rome in 1477, was Verrocchio's first great work in marble. The reliefs for this are now in the museum in Florence. About 1480 Verrocchio made the silver bas-relief of the " Beheading of St. John " for the altar of the baptistery in Florence, now the only remaining example of his goldsmith's work. From 1484–88 he worked chiefly on the equestrian statue of Colleoni in Venice. He caught a cold during its casting, and died from its effects. Verrocchio, although chiefly a sculptor, had more to do with forming the art of painting for his successors than any artist of his time. He takes rank among the greatest of the artists of the Renaissance. He was the master of Leonardo da Vinci, of Perugino, and of Lorenzo di Credi, and was a musician and mathematician as well as a sculptor and painter.

Verrucæ. See WARTS.

Versailles (vĕr-sä'ē), capital of the department of Seine-et-Oise, France; 11 m. SW. of Paris. It is regularly built, with broad and straight streets, and intersected by elegant avenues planted with trees. It has few manufactures and little trade. The chief attractions are the palace and the park. The palace, an enormous pile, 1,400 ft. long, cost 900,000,000 fr., was erected by Louis XIV, and was the residence of the French kings till 1792. To the N. of it are two palaces, the Grand and Petit Trianon, the latter the fávorite residence of Marie Antoinette. In 1837 Louis Philippe transformed it into a national museum, to commemorate the glories of France. The park, with its terraces, alleys, and fountains, was long considered a model of landscape gardening. Versailles has a national college, a normal school, numerous literary and scientific societies, and a public library of 75,000 volumes. Here was signed the treaty which recognized the independence of the U. S. It was here that the German Empire was founded in 1871. During 1871–79 it was the seat of the National Assembly and government of France. Pop. (1906) 54,820.

Verse (vėrs), a line of poetry usually forming a well-rounded rhythmic period. The maximum length assigned by the ancients was thirty or thirty-two short syllables (a long being counted as twice a short). Each verse is theoretically marked by one chief stress, and regularly has a slight pause at the end not included in the rhythm. " Verse " is often used for " stanza," and also is used collectively in the sense of " poetry," but usually in reference to the mere form. Blank verses do not end in rhymes. See POETRY; PROSODY.

Ver'tebra. See SPINE.

Vertebra'ta, the highest and most important branch of the animal kingdom. They have a primary axial skeleton (notochord) between the digestive and nervous systems, a nervous system which is not traversed by the alimentary tract, and gill slits, at least in the embryo, leading outward from the throat. The body of a vertebrate is nearly alike on both sides, and is covered with a skin several cells in thickness, from which may be developed protective structures—scales, feathers, or hair. The central nervous system consists of an anterior enlargement, the brain, and a posterior prolongation, the spinal cord. There are three sensory outgrowths which arise from the brain

—the paired eyes and the pineal or parietal eye, which is probably functional in no existing vertebrate. The special sense organs are three—the nose, eyes, and ears. In the lampreys the nose is in the central line; in the other forms it is paired. In only the higher vertebrates is there a passage through the nose to the throat. For the details of EYE and EAR, see those articles. The skull is a capsule for the protection of the brain and sense organs (cranium) and the face, including the jaws. These may all persist as cartilage, or they may be ossified and reënforced by other bones developed in the skin, and later united with the skull. In the more primitive forms the number of separate bones is large; ascent in the scale is usually accompanied by a fusion of separate elements. Thus the single sphenoid bone of man is represented by about twenty distinct bones in lower forms.

The digestive system begins with the mouth, after which come in order pharynx, esophagus, stomach, and intestines. From the intestinal region are developed as outgrowths two special digestive glands, the pancreas and liver. In the water-breathing forms the sides of the pharynx are perforated with gill slits, the walls of which are covered by delicate plates or fringes in which the blood circulates, while water coming in through the mouth passes to the exterior through the slits, and is thus brought into close connection with the blood, so that an exchange of oxygen and carbon dioxide is readily effected. In the higher forms these gill slits persist for but a short time, and in the mammal or bird one only can be found in the adult—the eustachian tube—which, closed at the outer end, connects the middle ear with the throat. In the air-breathing vertebrates the gills are replaced by lungs. The heart, the central organ of circulation, is primitively placed below the alimentary tract, just behind the gill slits, and in its simplest form consists of two chambers—an auricle which receives the blood and a ventricle which propels it forward. In the highest air-breathing forms a partition forms, dividing the auricle and ventricle, thus giving rise to the four-chambered heart. There is, besides, a lymph system, consisting of vessels and spaces ramifying all parts of the body, and communicating, here and there, with the blood circulatory system. In certain forms, portions of this lymph system become specialized into contractile organs, the lymph hearts. A portion of the lymph system, the chyle ducts, play an important part in transferring the products of digestion into the general circulation. The branch of vertebrates is divided into the Cyclostomata, including the lampreys and hagfishes, in which no true jaws are developed, and the Gnathostomata, with jaws, including all other forms.

Ver'tebrate Paleontol'ogy, the branch of science that treats of the structure, affinities, classification, and distribution of the ancient back-boned animals that are known only from fossil remains. From one view point it is a branch of zoölogy differing from it as a science only in that it deals almost entirely with prehistoric instead of living forms. From another aspect it may be considered a branch of geology, since its aid is absolutely indispensable in treating many fundamental problems of that science. The history of the back-boned animals, or vertebrates, as revealed by the study of their fossil remains shows constant change. At each successive stage in geologic time new forms make their appearance, while old ones disappear. Those forms that differ most from the existing assemblage of animals are those of the most remote past. For ages the only known vertebrates were fishes and certain low types allied to fishes. The earliest records of these have been found in the lower Silurian, but they probably had their origin even much earlier.

The principal fishes of the Silurian are the ganoids, or fishes with shining bony scales or plates, as on the present gar pike. These forms become very abundant and varied in the Devonian, which is the next highest age. The development of vertebrate life in the Devonian is so conspicuous that it is often called the "Age of Fishes." The most peculiar and characteristic vertebrates of this period are not true fishes, but belong to a much lower type called the ostracoderms, more nearly related to the lampreys, being without jaws or paired fins. Ganoids, sharks, lung fishes, and other cartilaginous forms were also abundant. The striking difference in the assemblage of the fishes of this period to those of the present fish fauna is the plentiful and varied varieties of primitive forms and the entire absence of true bony fishes. The amphibia, the lowest forms of the air-breathing vertebrates, have left their earliest record in the upper Devonian of Pennsylvania. These became of great importance in the Carboniferous period, were especially abundant in the Permian, and seemed to have reached their culmination in the Triassic. Many of them were of great size as compared with their living representatives, such as frogs, toads, newts, and salamanders. True reptiles in large numbers first made their appearance in the Permian, became more abundant and diversified in the Triassic, and reached their culmination in the Jurassic and Cretaceous.

The most striking reptiles of the Jurassic and Cretaceous were the gigantic and highly specialized dinosaurs which became extinct about the close of the Cretaceous. Some of these reached an enormous size, nearly rivaling the whales in bulk. The first records of birds and mammals are found in the Triassic. The former advanced very rapidly to nearly their present grade of organization. The mammals, however, remained very small and primitive throughout the Triassic, Jurassic, and Cretaceous periods. They began to be more diversified in the later Cretaceous and early Tertiary, and began to assume a somewhat modern aspect in the Eocene, where they advanced to that dominant place in terrestrial life among the vertebrates which they have since held. Ancestral forms of many of the living groups, representing the hoofed animals, primates, insectivors, carnivors, rodents, etc., became abundant in the Eocene, developed in the Oligocene, and became quite modernized in the Miocene. The first truly modern species appears only in the Pleistocene.

Ver'tigo, dizziness or apparent impairment of the equilibrium of the body. It assumes two principal forms: in one it appears to the subject as if objects were whirling about him; in the other, he fancies that he is forced to fall in some definite direction. Vertigo is rarely if ever continuous, but occurs in paroxysms provoked by some appreciable cause, as changing posture, eating, using the eyes, etc. Vertigo is sometimes the expression of disease of the brain, or of interference with the circulation of blood in that organ, but more usually it is a sympathetic disorder, caused by indigestion, anemia, disease of the internal organs of hearing, etc. Vertigo may be artificially produced by stimulants (alcohol) and by the application of galvanism to the head. Vertigo is not a disease, but a condition common to a number of diseases.

Vertum'nus, or **Vortumnus**, in Roman mythology, the god of the seasons, and, as the husband of Pomona, more especially the god of fruit. He was of genuine Italian origin. A feast, *Vertumnalia*, was celebrated in his honor on August 23d. He was generally represented as resembling Saturn.

Ver'ulam, Baron. See Bacon, Francis.

Ver'vain. See Verbena Family.

Vespasian (vės-pā'zhĭ-ăn), full name Titus Flavius Sabinus Vespasianus, 9–79 A.D.; emperor; b. Reate, Italy, of a family in ordinary circumstances; entered the army; held superior commands under Claudius in Germany and Britain; governed Africa as proconsul under Nero, and was sent in 66, at the head of a large army, to suppress the rebellion in Judea. When, after the murder of Galba, the civil war broke out between Otho and Vitellius, Vespasian was proclaimed emperor (July 1, 69), by his own army, and shortly after was recognized by the whole E. part of the empire. He left the final reduction of Judea to his son Titus, and proceeded to Rome, where, after the murder of Vitellius, he was recognized by the senate. A great change now took place in the government of the state. The new emperor was frugal and unostentatious in his personal habits, honest and open in his dealings with all persons. The character of the senate was restored, and the worst elements in it expelled. A firm discipline was established in the army. In his external policy he was also successful. Jerusalem, and with it the whole of Judea, were taken in 70; an insurrection in Gaul was suppressed; new conquests were made in Britain and Germany. For Rome he did much. He rebuilt the capitol, which had been burned by the adherents of Vitellius; he erected a Temple of Peace, began the Colosseum, and encouraged the restoration and rebuilding of those parts of the city which had remained in ruins since the great conflagration under Nero. He attended to business to his latest moment, saying that an emperor should die standing—and, in fact, did die in this attitude. His last remark was characteristic of his somewhat cynical humor: "Methinks I am becoming a god."

Ves'pers, in the Roman Breviary, the last but one of the canonical hours, the one preceding compline and following the nones. It is celebrated in public in the churches, often with brilliant music. The service occurs about the time of the lighting of the lamps, being theoretically proper to sunset, and varies with the day of the week.

Vespucci (vĕs-pôt'chē), **Amerigo**, 1451–1512; Italian navigator, from whom the name of America is derived. He was in business in Seville as an agent of the Medici family when Columbus returned from his first voyage. In 1499 he sailed from Spain in an expedition under Ojeda, which visited the neighborhood of Cape Paria and several hundred miles of the S. American coast, and returned in June, 1500. In 1501 he entered the service of Portugal, and took part in an expedition which visited the coast of Brazil. His narrative in Latin of this expedition was published at Strassburg in 1505. From this voyage he acquired the reputation of being the discoverer of the mainland. In 1503 he again visited Brazil. He then returned to the Spanish service, and before March 22, 1508, became pilot major. The name Americi Terra was applied to this continent as early as 1507, but it does not appear that Vespucci himself had any intention of taking the honor of the discovery from Columbus, with whom he was on friendly terms. It is hard to determine the time and extent of his various voyages, as his letters are obscure, and survive only in imperfect translations.

Ves'ta, in Roman mythology, the goddess of the home or hearth, corresponding to the Greek Hestia. Very few myths were formed on the idea of this deity, but the grave rites which her worship developed show that of the whole religious feeling which underlay the Roman mythology she formed the center. She was not represented by any image in her temples, but a perpetual fire burned on her altars, and each Italian city or community had raised an altar to her. The Vesta of the Roman Empire had her temple at Lavinium, on the Via Appia, 20 m. from Rome, and hither the consuls and other high officials of the republic went to offer up their sacrifice before entering on their duties. The Vesta of Rome had her temple in the Forum, near that of the Penates, and here she was served by her own priestesses, the vestal virgins, and a festival, the *Vestalia*, was celebrated June 9th. The number of the vestal virgins was originally four, afterwards six. They were chosen by the pontifex maximus when between six and ten years old, and they served the goddess for thirty years, spending ten years in learning their duties, ten in the performance of them, and ten in teaching them to the novices. Their principal duty consisted simply in keeping alive the sacred fire on the altar of the goddess, but thereby the guardianship of the holiest which Roman life contained was intrusted to them; and, although it has become impossible to us to fathom the bearing of this institution on the life of the community, numerous well-ascertained facts indicate the importance ascribed to it. When a consul met one of the vestal virgins in the streets, he bowed with reverence, and the lictors lowered the fasces while she passed by. When a convict was seen by one of the virgins, he was released if she demanded it. If the sacred fire went out from neglect, the priestess during whose watch it happened was stripped and scourged by the pontifex. If one of them committed adultery, she was buried alive, and her seducer was flogged to death in the Forum.

Ves'tals, or Vestal Vir'gins. See VESTA.

Vesu'vius, a volcano standing on the SW. shore of Italy overlooking the Bay of Naples. There are two mountain masses. That which is at present the higher is conical, with a crater at the top, and has an altitude of 4,000 ft., the height varying with the progress of eruption. The other mass is a crescent-shaped ridge partly surrounding the cone, and has an extreme altitude of 3,730 ft. It is called Monte Somma, and it is part of the rim of an ancient crater about 3 m. in diameter.

During the period of early Roman history Vesuvius is not mentioned as a volcano, and its fires had been dormant for so many centuries that its volcanic character was not generally understood. On its outer slopes were vineyards and gardens, and the interior of its crater was a plain several miles in width, partly covered by wild vines. It is related that Spartacus and his followers took refuge in this crater, where they were besieged by a Roman army. In the year 63 and afterwards there were earthquakes in the vicinity, and in 79 an explosion, followed by expulsive eruption, covered the surrounding country with volcanic ashes and volcanic mud. The cities of Herculaneum and Pompeii were destroyed and so deeply buried that even their sites were unknown for centuries. There ensued a period of quiet, followed by an explosion in 203, and other explosions or violent eruptions are historically recorded in the years 472, 512, 685, 993, 1036, 1138, 1306, 1500, and 1631. There were a number of periods a century or more in length during which the volcano was not active. From 1666 to the present the activity has been nearly continuous, the longest intervals of rest covering not more than four or five years. Recent notable eruptions were in 1903 and 1905. The activity of the last eighteen hundred years has been confined to the conical mountain, which bears specifically the name Vesuvius, and the mountain has been built up during that period by ashes and lava. Its summit has been repeatedly blown off by great explosions, after which new cones have been built within the crater. Monte Somma is part of the rim of the crater existing before the catastrophe of 79, and has had no share in the later activity.

Vetch, Fitch, or **Tare,** any one of several climbing herbs of the bean family. N. America and Europe have each several species, some common to both continents. One of the most important is *Vicia sativa*, or hairy vetch, extensively cultivated in Europe as a forage plant, and also occasionally grown in the U. S. The bitter vetches (*Orobus tuberosus*, etc.) are also forage plants of Europe. The tubers of some sorts are used as food. Other so-called vetches are the genus *Lathyrus*, often called vetchlings.

Vet'erinary Sci'ence. Veterinary medicine was studied among the ancient Egyptians, Arabs, Parsees, Hindus, and Greeks. The science was virtually lost in the destruction of the Eastern Empire, and only began to revive at the end of the sixteenth century, when Carlo Ruini wrote on the anatomy of the horse. But little real progress was made till 1762, when the prevailing epizoötics among farm animals led to the establishment of the Lyons veterinary college, speedily followed by the founding of similar institutions in every country of Europe. At present veterinary science embraces the anatomy, physiology, hygiene, dietetics, and general care of domestic animals, together with their diseases, therapeutics, and prophylaxis, the philosophy of breeding, shoeing, sanitary principles of building, drainage, and ventilation, the influence of soils and seasons on the food, water, and air, the effects of climate on the animal economy, the laws of contagion, the development and metamorphoses of parasites, etc.

BREAKING AND TRAINING OF HORSES.—In careful hands the colt should be led and handled while still with his dam, but should not be made a general pet and plaything. Many of the most incorrigible horses have been pets as foals, and learned at this early age to retaliate in their play. Training to bring a horse into condition for hard work consists in the removal of all superfluous fat, and the development and hardening of the muscles. The best condition is not to be attained by a training of a few weeks or months, and trotters rarely reach their highest speed until years after they are matured. The colt intended for this training should be fed on grain from the time he leaves his dam, and should have free scope for exercise and development. The final treatment is by sweating, physic, and graduated exercise. Sweating is employed mainly to get rid of superfluous fat, and may be secured by active exertion, by clothing, or by the Turkish bath.

One of the chief results of the growth of veterinary science has been the progressive decline of animal plagues. From a distribution so great that almost every part of every civilized country suffered, and from losses that amounted to millions of dollars each year, these diseases have been so restricted and, in some cases, exterminated, that present losses from diseases then prevalent bear but a small ratio to those then incurred. But the veterinarian has not yet fulfilled his function, for many new problems have arisen during the past few years, some of which are already partly settled, but others are still awaiting a solution.

Ve'to (Latin, "I forbid"), in the political language of modern nations denoting the act by which the executive power refuses its sanction to a measure proceeding from the legislature. In Rome the tribunes of the people, by saying *Veto*, could render of no avail a decree of the senate or the proceedings of magistrates. Under the ancient Polish constitution, any single member of the diet, by the use of the *liberum veto,* could hinder the passage of any measure. In most European countries the sovereign possesses a veto power, generally absolute; in England it has not been exercised since 1707. The President of the U. S. has a veto power, but a majority of two thirds in each house of Congress is sufficient to pass any measure over the veto. The governors of states and mayors of cities also generally possess the power, but in some cases a simple majority is sufficient to overcome it.

Vi'aduct, a structure by which a road is carried over a valley, the word being usually restricted to the case of a deep valley where the piers are a more prominent feature than the bridge proper. In such cases the bridge spans are short in order that they may be erected without other false works than the piers themselves afford. On account of the height of the piers they were formerly built of timber, but iron or steel is now employed. See Bridge.

Viat'icum, under the Romans, the traveling money or provision for a journey made for an official. In the Roman Catholic Church, the eucharist as administered to a dying person. If life be prolonged, the viaticum may be repeated from time to time, if so desired by the sick person, provided the mental faculties are preserved. In the early Church the term was applied both to baptism and the Lord's Supper, and sometimes even to absolution and reconciliation.

Vibra'tion, the rapid reciprocating movement consequent upon the tendency of a body, or parts of a body, disturbed from a position of equilibrium, to recover that position again; such are the rapid motions of a tuning fork or tightened string. Sound is due to the vibrations of air, etc., while light is due to vibrations of ether.

Vi'broscope, an instrument, invented in 1840 by Duhamel, for registering the vibrations of a sounding body graphically on smoked paper. See also Stroboscope.

Vibur'num, a genus of shrubs and trees of the honeysuckle family. It includes about eighty species, mostly natives of the N. temperate zone, some occurring in the Andes of S. America, and a few in the W. Indies and Madagascar. About a dozen species are natives of the U. S., including *Viburnum prunifolium* (black haw) and *V. lentago* (sheep berry), both with sweetish edible berries, and *V. opulus* (the cranberry tree), with sour edible berries. A cultivated form of the last named is the snowball. Several species are in common cultivation as ornamental shrubs.

Vicenza (vē-chĕnt'zä), capital of the province of Vicenza, N. Italy; on the river Bacchiglione and near Monte Berico; 42 m. W. of Venice. Vicenza is known for its palaces constructed by Palladio, a native of the town (1518–80), which, though condemned by critics and somewhat fallen into decay, are justly admired for their proportions and decorations. The cathedral has pictures and terra cottas, and is of fifteenth-century Gothic. At the foot of Monte Berico is the stripped and mutilated villa of Palladio, once one of the most splendid monuments of modern architectural art, and still retaining its fine proportions and most important features. Vicenza has manufactures of silk, linen, earthenware, and paper. Pop. (1901) 44,777.

Vice Pres'ident, an officer of the U. S. Govt., chosen at the same time and in the same manner as the President. (See Constitution of the U. S.) His only official duty is to preside over the Senate. In case of a failure of the electors to choose a Vice President, a majority of the votes of the Senators (a quorum of two thirds being present) will elect him; or if there be no majority, he is chosen from the two candidates who have received the highest number of senatorial votes. In case of a vacancy in the presidency, he becomes President of the U. S. As president of the Senate he has a casting vote in case of a tie. His salary is $12,000 a year.

Vichy (vē-shē'), town, department of Allier, France; on the Allier, nine hours by rail from Paris. It is celebrated for its mineral springs and baths. The mineral waters are both hot and cold, and are alkaline, containing chiefly sodium carbonate. They are charged with carbon dioxide; about 2,250,000 bottles are shipped annually. Its celebrity dates from the times of the Romans. Pop. (1901) 14,254; is increased to 40,000 during the season.

Vicks'burg, capital of Warren Co., Miss.; on the Mississippi near its junction with the Yazoo; 45 m. W. of Jackson, and 235 m. NW. of New Orleans. The site is highly picturesque, and the city has many fine drives, including one to the National Cemetery, where 17,000 Union dead are buried. About 60,000 bales of cotton are here shipped annually, besides large quantities of lumber, cotton-seed oil and cake, and general produce. There are railway shops, cotton-oil mills, and many smaller industries.

Vicksburg suffered severely during the Civil War. In 1876 the river cut through a neck of land, leaving the city on an inland lake. Since then the U. S. Govt. has been carrying on operations to divert the Yazoo River past the city and to restore the harbor. Pop. (1906) est. at 15,710.

Vicksburg, Campaign' and Siege of, military operations which took place during the Civil War in the U. S. After the capture of New Orleans (April, 1862), Vicksburg was the only strong point on the Mississippi held by the Confederates. It was well provided with batteries, and a line of works was constructed surrounding the city. On May 18, 1862, Farragut, coming up the river, demanded the surrender of Vicksburg, which was refused. He returned on June 26th with Flag Officer Porter's mortar flotilla, whereupon the bombardment of the city began and was continued until about July 22d. On June 28th Farragut ran past the batteries with two ships and five gunboats. A land force under Gen. Thomas Williams, of about 3,000 men and 1,200 negro laborers, was meanwhile trying to cut a canal, for the passage of gunboats and transports, across the peninsula opposite Vicksburg; but before its completion a rise in the river destroyed all that had been done. On the night of July 15th Farragut's fleet ran down past the batteries, engaging them and the ram *Arkansas* on the way, and on July 27th, having taken Williams's troops on board, withdrew to Baton Rouge and New Orleans. The Confederate reports state that little damage was done by the bombardment.

On November 26th, 1862, Gen. Grant started from Grand Junction, but on December 20th Gen. Earl Van Dorn captured his depot at Holly Springs and compelled his withdrawal. Gen. Wm. T. Sherman, starting from Memphis on December 20th, moved down the river, and on the 29th assaulted Chickasaw Bluffs, but was repulsed by Gen. John C. Pemberton, who was in command at Vicksburg. Grant, wishing to get a footing on the high ground in the rear of Vicksburg which touches the river below the city, made an attempt to cut a canal near the one previously begun by Williams, and unsuccessfully tried to find a water route through the bayous. As the river fell enough to make the roads passable, he marched his army by land on the right bank to De Schroons, where on April 30th it embarked on the fleet which, under Porter, had run down past the batteries of Vicksburg on April 16th and bombarded Grand Gulf April 29th. Grant moved down the river, landed at Bruinsburg, and marched toward Jackson, severing his connection with the river on May 11th. The battle of Raymond was fought and won on the 12th. Jackson was captured on the 14th, and the battles of Champion Hill and Big Black River were won on the 16th and 17th, respectively. On the 18th Grant was in front of Vicksburg.

On the 19th he made an assault which gave him a better position, and on the 22d a general assault was made, which was repulsed with great loss. The regular siege then began, and continued with an uninterrupted bombardment until the city surrendered, July 4, 1863—the same day as the victory at Gettysburg. The total force surrendered by the Confederates was over 31,000 men and 172 guns; their previous losses during the campaign and siege exceeded 10,000 men and 90 guns. Grant's total losses in this campaign and siege were about 10,000 men; his total force near Vicksburg was between 60,000 and 70,000 men. The fall of Vicksburg was followed on July 9th by that of Port Hudson. This opened up the Mississippi. Although the banks of the river were at times occupied by guerrillas and cavalry raiders, no serious interruptions to its commerce were caused by the Confederates after this date, and the Confederate states on the W. were separated from those on the E. up to the close of the war.

Vic'tor Emman'uel II, 1820–78; King of Sardinia from 1849 to 1861, and thereafter King of Italy; b. Turin; commanded the Savoy Brigade in the campaigns against Austria in 1848–49, and distinguished himself by his brilliant personal valor at Goito and Novara. On the evening of the disastrous battle of Novara (March 23, 1849) Victor Emmanuel ascended the throne under very critical circumstances. Peace had to be bought of Austria, and the state was divided into contending factions. The young king himself was as yet by no means popular. Supported by Cavour, he succeeded in restoring the finances to order, reorganized the army, concluded commercial treaties with foreign powers, limited the privileges of the clergy, secularized the Church property, and established popular education. The pope excommunicated him, but all intelligent men in Italy began to look on him as the coming liberator, the more so that he with great boldness gave all political refugees from the other Italian states an asylum.

By his participation in the Crimean War he secured for Sardinia a recognition in the political system of Europe, and finally, in 1859, he was able to renew the contest with Austria by the aid of France. By the Treaty of Villafranca (July 11th) and the Peace of Zurich (November 10, 1859), Lombardy was added to his dominions. The aid of France was secured at the cost of Savoy and Nice, and in spite of Napoleon's promises Venetia still remained an Austrian province; but at the same time Parma, Modena, Tuscany, and parts of the Papal States annexed themselves to Sardinia; and soon afterwards the campaign of Garibaldi in Sicily and Naples produced the same result for S. Italy. On March 17, 1861, Victor Emmanuel assumed the title of King of Italy. Meanwhile the situation continued to be difficult. Venetia and Rome were still wanting, and great success had at once made the Italian people impatient and the relation to other powers, even to France, very delicate. Victor Emmanuel sought and found an ally in Prussia; and although the Italians lost the battle of Custozza (June 24, 1866), by the Peace of Vienna (in October) Austria ceded Venetia. When, during the Franco-German War, the French garrison was withdrawn from Rome, the city annexed itself by a popular vote to Italy, and on July 2, 1871, Victor Emmanuel entered the city and took up his residence in the Quirinal Palace.

Victor Emmanuel III, 1869- ; King of Italy; succeeded his father, Humbert I, July 29, 1900.

Victo'ria (or, as baptized, ALEXANDRINA VICTORIA), 1819–1901; Queen of Great Britain and Ireland and Empress of India; only child of Edward, Duke of Kent, fourth son of George III, and of his wife, Victoria Mary Louisa. Her father having died January 23, 1820, she was educated under the care of her mother and the Duchess of Northumberland; became heiress presumptive to the crown on the accession of William IV in 1830, and on his death without issue (June 20, 1837) assumed the throne of Great Britain and Ireland, that of Hanover falling by the law excluding females to her uncle, the Duke of Cumberland. She was crowned in Westminster Abbey June 28, 1838; was directed in politics by Lord Melbourne, the head of a Whig administration, a statesman to whom she was personally and politically much attached; was married at St. James's Palace to her cousin, Prince Albert of Saxe-Coburg-Gotha, February 10, 1840. She enjoyed a reign of peace and prosperity unexampled in the annals of England under the successive administrations of Lord Melbourne, Sir Robert Peel, Lord John Russell, Earl Derby, Earl Aberdeen, Lord Palmerston, Benjamin Disraeli, W. E. Gladstone, Marquis of Salisbury, and the Earl of Rosebery.

Among the events of her reign were the repeal of the Corn Laws, 1845; the Irish famine and emigration to the U. S., 1847; the Chartist agitation, 1848; the Crimean War, 1853-55; the Indian mutiny, 1857-58; the assumption of the direct government of India, 1859; the "cotton famine" and the delicate relations with the American belligerents, 1861-65; the Mexican intervention and its rupture, 1861-62; the Reform Bill of 1866; the confederation of British N. America, the disestablishment of the Irish Church, the abolition of religious tests at the universities and of the system of purchase in the army; the Alabama Claims Treaty, 1871; the introduction of the ballot; the wars in Abyssinia, Egypt, Sudan, and S. Africa; the assumption of the title of Empress of India, 1876; the creation and organization of the Australasian colonies, the remarkable development of public education, and the prolonged agitation on the subject of home rule in Ireland. In 1876 the agitation upon the massacres in Bulgaria presaged important action upon the "Eastern question."

Queen Victoria was beloved for her admirable personal qualities, and beyond any other monarch gave evidence that she regarded her royal authority as held in trust for the people. She was a pattern of domestic virtue. The progress made by the nation during her reign was aided by her wisdom, tact, and devotion. She also gave evidence of literary culture by the publication of "Leaves from the Journal of Our Life in the Highlands," "More Leaves from the Journal," etc., and by supervising two biographical sketches of Prince Albert—"The Early Days of His Royal Highness, the Prince-Consort" (1867), by Gen. C. Grey, and the "Life of the Prince-Consort" (1874), by Theodore Martin. The completion of the sixtieth year of her reign was enthusiastically celebrated June 22, 1897. The pageant in London is said to have been the most magnificent the world has ever seen. Every part of the vast British Empire was represented by troops and dignitaries, and princes and special ambassadors from every country of Christendom united.

Victoria, a British colony occupying the SE. part of Australia; the first of the seven Australasian colonies in density of population, the fourth in order of establishment, and the sixth in area; triangular in form, with the apex at Cape Howe and the base on the meridian of 141° E.; separated from New S. Wales by the Murray River. Area, 87,884 sq. m.

The coast line is about 800 m. long, and there are few islands. Wilson's Promontory, the S. point of Australia, separates the waters of the Pacific from those of the S. or Indian Ocean and divides the coast line of Victoria into two nearly equal parts. To the E. is a long, gentle sweep of low sandy shores, behind which is a series of lakes and coastal lagoons. The coast W. of Wilson's Promontory is divided by Cape Otway. Nearly midway between the two capes is the narrow entrance of Port Phillip Bay, giving admission to Melbourne, on the Yarra Yarra River, 4 m. from the head of the bay. The bay is 40 m. long by 30 broad, and has abundantly deep water and several ports on its shores. Melbourne, the capital of the colony, is accessible to vessels drawing 19 ft. W. of Cape Otway the coast is generally bold. The E. part is mountainous, with plains along the coast, and the W. part is an extended plain. The Australian Alps enter the colony near the head of the Murray River, coming from New S. Wales, where they culminate. The highest point in Victoria is Mt. Bugong, 6,508 ft. It is a wild complex of ranges, generally covered with dense vegetation, including the enormous tree growths for which Victoria is famous, for the most part nearly impassable and unexplored. These mountains produce a series of plateaus whose elevation gives them a temperate climate, and which form attractive agricultural lands. W. from the Alps extends the Dividing Range, 1,500 to 3,000 ft. high, passing in the W. into the Australian Pyrenees, and terminating in several cross ranges, of which the Grampians are the last and highest (Mt. William, 3,600 ft.). To the S. of the Pyrenees are the Mountains of Cape Otway, wild and picturesque, reserved by the state because of their forests. The W. plains are slightly undulating.

The Murray River is the principal stream of Australia. On the Pacific slope the most important stream is the Snowy River (300 m. long). Farther W. a series of smaller streams drain the fertile Gippsland. The next largest coast river is the Glenelg (280 m.), in the extreme W. The Victorian streams generally are subject to heavy annual overflows. In temperature and rainfall Victoria resembles central California. The worst season is the summer; the most agreeable is the autumn. Snow is common in the mountains, but rare at sea level, and has been observed only twice at Melbourne. The dominating forest forms are the gum trees of the genus *Eucalyptus*, and the *E. amygdalina* in the mountains attains an enormous size, surpassing the big trees of California. The largest recorded is one found prostrate, which measured 470 ft. in length and 81 ft. in girth near the roots. These trees have a white, slender, smooth trunk, running up 60 or 70 ft. to the first branch. The dense "mallee" scrub covers many thousand acres in the the NW. The blue gum is the species now generally introduced into warmer America and Europe. The red gum, or "hard wood," makes a highly prized lumber, because it is almost unaffected by water. The myrtle family has many other species, and other characteristic plants are acacias and tree ferns.

The native mammals are of the Australian marsupial type—the kangaroo, wallaby, wombat, bandicoot, and opossum. The birds and reptiles are numerous, and some of the latter are venomous. Many European species have been introduced, and have become perfectly acclimated. The rabbit has multiplied in such numbers as to have become a serious pest. The camel has been found well adapted to the interior plains, the African ostrich seems to prosper, and the Asiatic elephant has been imported. The trout has been acclimated, and has taken possession of some of the streams. This colony leads the Australasian colonies in the production of gold, of which it has furnished nearly two thirds of the entire Australian output, but of late years the Queensland has nearly equaled the Victorian output. The total production from 1851 to 1907 was estimated at 69,956,448 oz., valued at £279,471,595. The mining was at first in surface placers, but for alluvial mining it is found necessary to sink shafts to the beds of ancient rivers. Quartz mining is gradually taking the place of alluvial, but with increase of depth the profit is diminishing. The gold fields of Victoria occur over the area bounded on the W. by the Avoca River and on the S. by the parallel of Melbourne. Over the area thus defined the fields are thickly distributed, and fully one third of the colony is believed to be capable of gold production. Great discoveries of coal were announced in 1894, and it is hoped that the colony can soon furnish what is needed for her own consumption. The deposits of iron have attracted attention, and small quantities of other minerals are found.

About 20 per cent of the colony is suitable for tillage and 28 per cent for grazing. Only about 5 per cent of the entire acreage has been alienated. The chief crops, in the order of their importance, for 1908 were wheat, hay, oats, barley, potatoes. Tobacco is widely cultivated. In 1907 the vine covered 26,465 acres. The fruits of Europe have been introduced, and most of them are productive. Victoria is the most closely stocked of the seven colonies. Its wool brings a higher price than that of the others, and it devotes more attention to dairy products than any other, except New Zealand. Extensive districts of the colony do not receive sufficient rainfall for agriculture, and irrigation has been extensively tried by private enterprise.

The estimated population (1901) was 1,201,341. The Chinese numbered 9,377 in 1891—materially less than at the preceding census. The aborigines are of the Australian race. On the arrival of the first colonists they were variously estimated at from 6,000 to 15,000. In 1851 they numbered 2,693; in 1891, 565.

There is no state church, and no assistance from public funds is given to religious institutions. The Anglican Church embraces 37 per cent of the population, other Protestant sects 38 per cent, Roman Catholic 22 per cent. Education is entirely secular, and primary education compulsory. There is a full complement of schools of all grades, and the percentage of illiteracy for all over fifteen is two per cent. Melbourne Univ. is both an educational and examining body. The public library at Melbourne has about 512,000 volumes and pamphlets. In 1907 Melbourne had a population of 526,400; Ballarat, 48,565; Sandhurst (Bendigo), 44,140; Geelong, 27,416. No other town had 10,000 inhabitants.

Imports are subject to a heavy tariff amounting in 1907 to £2,340,070, equal to eight and one third per cent of the total value of imports. The chief imports are wool and woolens, cottons, sugar, coal, tea, live stock, timber, iron and steel (in the order of importance). Nine tenths came from the United Kingdom and the other colonies, about half from each. Less than three per cent came from the U. S. About half the exports go to Great Britain. The staple exports are wool (about £6,000,000 annually, but a part is from New S. Wales) and gold (about £4,000,000 annually). Next in importance are wheat and its products, tallow, leather, and preserved and frozen meats. The value of the last has fallen off largely. The railways belong to the colony, and the network is the most complete of the seven colonies, besides connecting Melbourne with Sydney and Adelaide. On June 30, 1899, 3,160 m. of railway had been completed at a total cost of £38,974,410, nearly all borrowed money. The net profit was enough to pay 2.98 per cent on the borrowed capital, drawing about 4 per cent.

The constitution dates from 1854. The legislative power rests in a parliament of two chambers—the upper, of thirty-four members, from whom a property qualification is required, elected for six years by special electors, and a lower, of sixty-five members, elected for three years, without special qualification, by general suffrage of adult males. Clergymen are ineligible to either house. The executive power is vested in a governor appointed by the crown, and assisted by a cabinet of ten responsible ministers. Local government is representative, and ratepayers have a number of votes, gauged by the rates paid. The public revenues are derived from the railways, the post, the telegraphs, from crown lands, and from taxation. The taxes include customs, excise, inheritance fees, stamp duty, land tax, etc., named in the order of their capacity for producing revenue. The chief expenditure is on account of the public debt. This on June 30, 1906, was £52,904,800, bearing nearly 4 per cent. It was nearly all incurred for railways and other public works. Colonization began in 1826; Melbourne was founded in 1836; and the colony was erected at the expense of New S. Wales in 1850. The discovery of gold in paying quantities in 1851 led to an enormous influx of population. Except for a painful recovery from "gold fever," the colony progressed steadily for the next forty years without noteworthy incidents, becoming eventually the leading colony in density of population and in wealth. The financial and commercial distress following 1891, which was more keenly felt in Australia than most other parts of the world, especially distressed Victoria, and most of all Melbourne, where there had been much booming of real estate. As a result, increased attention has been directed to the colony's natural resources.

Victoria, capital of the province of British Columbia, Canada; at the SE. extremity of Vancouver Island, on the Strait of Fuca, 75 m. NW. of Seattle, Wash. Victoria has an inner and an outer harbor, the former being shallow, while the outer can accommodate the largest Pacific steamers. The climate resembles that of the S. England. Among the finest buildings are the provincial legislative assembly, post office, customhouse, supreme courthouse, government house, the official residence of the lieutenant governor; the city hall, the Catholic cathedral, etc. The industries include timber work, tanning, brewing, and shipbuilding. The lines of steamers which ply from Victoria and the fact that the town is an important railroad terminus add to its prosperity. Victoria was originally a trading post of the Hudson's Bay Company, established in 1843. Pop. (1910) 50,000.

Victoria Cross, a British decoration instituted at the close of the Crimean campaign in 1856, and given only to those who have performed in the enemy's presence some signal act of bravery. It is in the form of a Maltese cross, and is made of bronze, having the royal crown in the center, surmounted by the lion, and on a scroll below the words, "For valour." The ribbon worn is blue for the navy and red for the army. On the clasp are two branches of laurel, from which hangs the cross. A pension of £10 a year accompanies the decoration.

Victoria Cross.

Victoria Nyan'za, the largest lake in Africa, the second fresh-water lake in size in the world, and the principal source of the Nile; known to the natives as *Ukerewe Nyanza* (Ukerewe Lake), from the name of its largest island. The equator passes through its N. portion; area about 27,000 sq. m.; altitude above the sea, 3,880 ft. The lake was discovered in 1858 by Capt. Speke, and in his second journey (1862) he practically solved the question as to the sources of the Nile, identifying the outflow of Victoria Nyanza as the upper course of the river. The lake is very deep in places. The water is fresh and pure, though insipid to the taste. Fish are plentiful, and are caught mostly with hook and line, though natives in the NE. use grass mats as a sort of net, and the islanders of the great Sesse Archipelago use basket traps. The lake is infested with alligators, making it dangerous to enter the water. Hippopotami are not plentiful except along the coast and rivers, but those found in the open water are vicious, and are much feared by canoe men. A curious feature, also observable in Lakes Tanganyika and Nyassa, is the periodical rise and fall of the waters, which, according to the natives, takes place about once in twenty-five years. These changes in level are distinctly shown by water marks on the stones. It is suggested that, as the visible, inflowing streams seem totally inadequate to keep up the supply of water in the lake, there are probably large springs at its bottom that make up the deficiency.

Victoria Re'gia. See WATER-LILY FAMILY.

Victo'rium, an elementary substance obtained by Sir William Crookes, of London, in fractioning the rare earth yttria. Crookes found in a photograph of a spectrum not visible to the eye a group of lines indicating a new element for which he proposed the name *victorium,* in honor of the queen. Victoria, the oxide of victorium, differs from yttria in many of its chemical characters. In the purest state in which it has been prepared victoria is of a pale-brown color. The atomic weight of victorium is about 117.

Vicugna. See VICUÑA.

Vicuña, or **Vicugna** (vĭ-kôn'yä), an extremely wild and active animal of the Andes, somewhat smaller than the alpaca. It is of a uniform brown color, and great numbers are killed for the sake of the hair, which is even more valuable than that of the alpaca.

Vidocq (vē-dŏk'), **Eugène François,** 1775–1857; French detective. He was a baker of Arras, of athletic frame, notorious as a thief and bully, was some time a soldier, and was sentenced at Lille to eight years' hard labor for forgery, but repeatedly escaped. In 1808 he became a private detective in Paris; then rose to be chief of the *brigade de sûreté,* mainly composed of reprieved convicts and other such characters. He rendered important services, received in 1818 a full pardon, and remained connected with the police till about 1828. Many works which he did not write appeared under his name, and some also deny his authorship of his "Mémoires."

Vien'na (German, WIEN, a word of Celtic origin), the imperial capital of Austria-Hungary; on the Danube, 340 m. SSE. of Berlin. Here occurs the only break in the great chain of the Alps and Carpathian Mountains, which divide the NW. from the SE. part of central Europe. Hence it was chosen by the Romans, about the beginning of our era, for settlement and fortification. During the Middle Ages it became a great center of trade between N. and S., E. and W., and thus acquired a cosmopolitan character which renders it to-day one of the most interesting and beautiful cities of Europe. It is traversed by a navigable canal, called the Little Danube to distinguish it from the Great or main Danube, whence its waters are drawn. The Wien is an insignificant streamlet. The city lies at the base of the double-peaked *Kahlenberg* (Bald Mountain), on which is seen the border of the *Wiener Wald* (Viennese Woods), whose beauty renders the environs of the city among the most attractive in the world. The extremes of temperature are zero and 92° F.; the mean, 48°; the average rainfall, 24 in., with rain on 149 days in the year.

The Ringstrasse is the finest boulevard; it occupies the site of the old walls. The largest of the ten parks in Vienna is the Prater, in one part of which is the fashionable drive; another portion is known as the Wurstel-Prater, or Punch and Judy Park, where a great variety of cheap shows is offered to the masses. The city streets are mostly paved with granite blocks, and are kept remarkably clean. Vienna is supplied with pure mountain spring water, brought to the city in an aqueduct 60 m. long. The public and private buildings of Vienna include some of the finest products of modern architecture. The Parliament building is an immense white marble structure in Greek style, elaborately ornamented with colossal statues and reliefs. The Rathhaus (municipal hall), of yellow sandstone, is a magnificent adaptation of Gothic motives. The court theater is of white marble, in Renaissance style, and its sculptures tell the story of the world's drama. The "Triumph of Bacchus," which ornaments the blocking course of the main façade, is one of the grandest of modern reliefs. The university building is a beautiful example of Renaissance design. Other noteworthy buildings are the Court Opera House, the Academy of Fine Arts, the Austrian Industrial Museum, the Bourse and Commercial Museum, the Arsenal, and the Palace of Justice. Of the churches the grandest is St. Stephen's Cathedral, whose corner stone was laid in the twelfth century. Its graceful tower rises 453 ft. The most beautiful ecclesiastical structure is the Votive Church, ornamental Gothic in style, erected in commemoration of the escape of the Emperor Francis Joseph from assassination in 1853. Churches are not numerous in Vienna, and as a rule contain but little to interest the traveler. There are about forty monasteries and nunneries. Schools are provided by public, private, and corporate means, and give instruction in every department, from hairdressing to theology. The primary schools are well attended. There are many technical schools for teaching bookbinding, printing, glove making, gardening, glass blowing, the making of fans, optical instruments, etc.; also middle and high schools (*gymnasia*) and commercial colleges. There is an Agricultural College, an Academy of Fine Arts, a Polytechnicum, and a Protestant Theological Seminary (the Roman Catholic forms one faculty of the university). The Theresianum is a school founded by Maria Theresa to prepare noblemen's sons for public service. One department of it is known as the Oriental Academy, where students are prepared for diplomatic and consular service in the Orient, and before graduating must have a good knowledge of law in its various branches, of political science, and at least a reading knowledge of ten modern languages. The university has the largest attendance at any institution where German is spoken. It was founded in 1365, has passed through many vicissitudes, was under Jesuit domination for a century, and has been greatly improved since 1870. Its medical faculty has enjoyed world-wide fame for a hundred years.

The city is well supplied with libraries, the largest of which is the imperial, which contains 400,000 volumes and 20,000 MSS. There is also an imperial private library. The Albertina contains 40,000 volumes, largely, if not exclusively, pertaining to matters of art. There are also extensive libraries in connection with the university, Theresianum, Academy of Fine Arts, Rathhaus, and the Polytechnicum, besides a music archive. Censorship of the press still exists, and is at times rigorously exercised. The Academy of Sciences was founded in 1847. The imperial art collections have a magnificent home, and are said to surpass all other collections in pictures by Rubens, Dürer, and Van Dyck, and to be remarkably rich in paintings by Titian, Tintoretto, Holbein, and Clouet. In the possession of portraits of children by Velasquez, Vienna is said to rival Madrid itself. Under the same roof stands Canova's greatest work, "Theseus and the Centaur." In the companion building, the dome, painted by Makart, contains what is believed to be the largest pictorial canvas in the world. The city has established a permanent educational exposition, containing about 18,000 objects of educational value.

The love of music is strong in the Viennese; and here, where Gluck, Haydn, Mozart, Beethoven, Schubert, Wagner, Brahms, Strauss, Lanner, Millöcker, and Suppé have made their home, music of all kinds is enthusiastically cultivated, as is attested by the existence of 100 music schools, sixty musical societies, and a large number of concert halls.

The pop. (1907) was 1,999,912. The commercial supremacy of Vienna received a serious blow when in 1867 Hungary was given a constitution which made it practically independent of Austria; and the more recent Bohemian contention for autonomy has caused Prague to be favored more or less at the expense of Vienna. The international seed market of Vienna has acquired great importance; the export of shoes, men's clothes, hats, imitations of Oriental rugs, is very extensive. In the making of silk goods, of instruments for surgical, mathematical, and physical work; of pianos, violins, and other musical instruments; of fancy leather goods, of amber and meerschaum goods, of embroideries, Vienna holds an important place. Taxes on articles of consumption are still imposed at the entrances to the city, but have been greatly simplified. Much is done for the poor. There are over seventy hospitals, orphan asylums, and other charitable institutions. The general hospital is one of the largest in the world.

The city government consists of a burgomaster, two vice burgomasters, a city or select council, and a large common council. The burgomaster is chosen by the electors, and his appointment must be confirmed by the emperor. The police system is partly under state control.

The Roman camp Vindobona grew and became a city, and was the scene of the death of Marcus Aurelius in 180. Then for five centuries nothing whatever is known of it. In 1030 it was mentioned under its present name, and it was then a walled place of importance. The Celts of this region were conquered by Charlemagne, and afterwards German settlers came. The Babenberger margraves were the rulers. In 1221 it received its first recorded charter of privileges; in 1237 a *Freibrief* was given it by Frederick of Hohenstaufen, which is still preserved. In 1276, Vienna, with Austria, Styria, etc., passed into the hands of Rudolph of Hapsburg. From 1485–90 the city was occupied by the powerful and learned

Hungarian king, Matthew Corvinus. In 1526 a new city ordinance was issued by the Archduke Ferdinand, which is known as "the grave of the city's freedom," under which the city was practically ruled until the Revolution of 1848. In 1529 and in 1683 Vienna was besieged by the Turks. The successful defense against the first siege was under the leadership of Count Nicholas Salm. The second siege was ended by the victory of a relief army. In the winter of 1805–6, and the summer of 1809, French troops occupied the city. His fate was sealed at the congress which met here in 1814–15. During the troubled times of 1848 Vienna was for a time the hope of the European revolutionists; but it was bombarded and taken by the imperial troops, October 31st. A new constitution was given March 17, 1849, but did not become valid until 1861. On December 20, 1857, the emperor signed the decree for the removal of the city walls, which has contributed much to the beauty of the city. In 1890 the city was much enlarged, and now covers nearly 64 sq. m.

Vienna, Concor'dat of, an agreement signed at Vienna, August, 1855, between Pius IX and Francis Joseph of Austria, by which the clergy obtained control of public instruction, and jurisdiction over cases of canon law, especially those concerning marriage, was given to the ecclesiastical courts. The concordat was abrogated, 1870.

Vienna, Con'gress of (September, 1814, to June, 1815), a congress of the European powers to readjust the affairs of Europe after the Napoleonic wars. There were present the monarchs of Austria, Prussia, Russia, Denmark, Bavaria, and Würtemberg, besides a crowd of minor princes and diplomatic representatives of all European states except Turkey. During the congress Vienna was the scene of continual festivities of the most sumptuous kind. The business of the congress was hindered by intrigues and petty jealousies which were cleverly fostered by Talleyrand for the advantage of France, and at one time war seemed inevitable, but the news of the return of Napoleon from Elba in March, 1815, frightened the statesmen into harmonious action. At first the two most serious questions before the congress were those respecting Poland and Saxony. Russia claimed the former, Prussia the latter. Talleyrand, advancing the theory of *legitimacy*, sided with Austria against Prussia on the Saxon question, and raised France to a position of controlling influence in the congress. Finally, a compromise was reached, giving the lion's share of the duchy of Warsaw to the czar, to be formed into the Kingdom of Poland, and dividing Saxony between Prussia and the Saxon king. The pope was reinstated in all his possessions, with the exception of Avignon and Venaissin, which were given to France, and some small Italian districts, which were given to Austria. Italy was parceled out in domains for French and Austrian princes. Austria was reëstablished in its old glory as an utterly artificial agglomeration of different nationalities. Norway was taken from Denmark and added to Sweden, in order to pay Bernadotte for turning against Napoleon, and Denmark was paid with Lauenburg and other German districts. The Spanish Netherlands (Belgium) were added to the Dutch Netherlands, and the whole formed into the Kingdom of Holland. To restore the German Empire was found impossible, on account of the rivalry between Prussia and Austria, but, having restored some of the petty princes, the congress manufactured a *Bund*, which remained the sole central government for Germany till 1866.

Vienne (vē-ĕnn'), ancient, *Vienna*, an ancient town of France; department of Isère, on the Gère, 19 m. S. of Lyons. It contains many remains of the Roman epoch, such as a triumphal arch, an amphitheater, and a temple. Pilate is said to have been banished to this place. It was the cradle of Western Christianity. The fifteenth ecumenical council of the Roman Catholic Church met here, 1311–12. There are rich silver and iron mines in the vicinity, and an excellent wine is produced. The manufactures include woolen and linen fabrics, cutlery and hardware, iron, glass, and leather. The trade is brisk. Pop. (1901) 24,619. Vienne is also the name of a department of France; capital, Poitiers.

Vig'ilance Commit'tee, an association of persons to put down crime by inflicting summary punishment. They have done good work in many W. states of the U. S., though liable to degenerate into criminal and blackmailing agencies. They have been known as "regulators," citizens' associations, and vigilantes.

Vigny (vēn-yē'), **Alfred Victor** (Comte de), 1799–1863; French poet; b. Loches, Indre-et-Loire, France; entered the Royal Guard in 1816, but retired from military service in 1828, and devoted himself to literary pursuits. His "Poèmes" (1822), among which are "Hélène," "La Fille de Jephté," etc., and his "Poèmes antiques et modernes" (1824–26), among which are "Moïse," "Le Déluge," "Eloa," "Dolorida," etc., passed by almost unnoticed, though they belong to the best which the romantic school has produced in France, and entitle him to rank among the first half dozen French poets of the century. But in 1826 his historical novel, "Cinq-Mars," attracted much attention; and in 1835 his drama "Chatterton," made his name celebrated. He also wrote "Stello," "Servitude et Grandeur militaires," short stories tinged deeply with pessimism; "Les Destinées," a philosophical poem, published after his death, etc.

Vi'king, name applied to those vast numbers of Scandinavian naval warriors who, in the ninth and tenth centuries, made the waters of Europe, and particularly those of W. Europe, unsafe. The ninth and tenth centuries are usually styled the Viking Age. The Scandinavian vikings were excellent shipbuilders and expert seamen. By the aid of the sun, moon, and stars they were able to navigate in the open sea. They were the first to venture out of sight of land in ships. None other than coast navigation had ever been attempted by any people before the vikings found their way across the open North Sea to Great Britain, to the Faeroes, to Iceland, Greenland, and Finland.

Vil'lain, or **Villein,** primarily and strictly the servile peasant of the feudal era in England; in a wider sense, any person, bond or free, who held land by the tenure or upon the conditions of the servile peasantry. The term *villanus*, adopted and fixed by the "Domesday Book," is constantly employed in this double sense in the manorial and legal records of the thirteenth and fourteenth centuries. See FEUDAL SYSTEM.

Villars (vē-yär'), **Claude Louis Hector** (Duc de), 1653–1734; marshal of France; b. Moulins, department of Allier, France; fought with distinction under Turenne, Luxembourg, and Créqui; was also employed in diplomatic negotiations; ambassador to Vienna, 1699–1701. October 14, 1702, he defeated Prince Louis of Baden at Friedlingen, and was made a marshal; next spring he penetrated through the passes of the Black Forest and joined the Elector of Bavaria, and won a victory over the imperial forces under Styrum at Höchstädt. He succeeded Vendôme in 1709 in the command of the grand army in the Netherlands, numbering 120,000 men, but was defeated and severely wounded at Malplaquet, September 12, 1709. Having recovered, he again took command of the grand army, now the last which France was able to raise, and gained a brilliant victory over the allied English-Austrian force under the Earl of Albemarle at Denain, July 24, 1712, which contributed much to the conclusion of the Peace of Utrecht. He negotiated and signed the Treaty of Rastadt (March 6, 1714). During the regency and the reign of Louis XV he continued to have much influence on the foreign policy and all military affairs, and when, in 1733, a war with Austria broke out, he was placed in command of the army in N. Italy. Although eighty-one years old, he displayed remarkable energy, but disagreement with the King of Sardinia caused him to resign.

Vil'lein. See VILLAIN.

Villeneuve (vēl-növ'), **Pierre Charles Jean Baptiste Sylvestre de,** 1763–1806; French admiral; commanded a division at the battle of the Nile, and, being blockaded by Nelson in Cadiz, sailed out and lost the battle of Trafalgar.

Vil'liers, George. See BUCKINGHAM, GEORGE VILLIERS, DUKE OF.

Villiers, George William Frederick. See CLARENDON.

Villon (vēl-lôn'), **François,** 1431–abt. 1484; French poet; b. Paris. His real name was DE MONTCORBIER, and he had several aliases. He studied at the university, and became a master of arts, 1452. In 1455, having killed a priest in a brawl, he was sentenced to banishment, but on proof that he had been attacked by the priest he received a pardon. He now devoted himself to writing his "Petit Testament." But he was soon in trouble again. Henceforward his life was such as has been associated with his name. Shortly after his arrival at Angers a chapel was robbed of 500 crowns, and the theft was traced to a band of student robbers, one of whom accused Villon of being their leader, and asserted that he had planned similar burglaries at Angers. Villon was caught, tortured, and with five others was sentenced to be hanged. On this occasion he composed his "Ballade des Pendus," an epitaph by anticipation on himself and his comrades swinging on the gibbet. He escaped this picturesque fate, however, by appealing to the Parliament of Paris, which commuted his sentence to banishment. On his reappearance in 1461 he is found spending the summer in the prison of the Bishop of Orleans at Meung. His crime was probably sacrilege or burglary. This time he owed his escape to a jail delivery on the accession of Louis XI. He now wrote his last and greatest work, his "Grand Testament," and it is probable that he did not survive much longer, worn out, as he admits himself to be, by excesses, prison life, and perhaps consumption.

Villon's poetry may be considered as marking an era in the literature of Europe. In it we find the personal note, so wanting before his time, a strong capacity of feeling and expression, and a mournful tone, arising from the poet's sense of the vanity of the joys of mere life and perhaps from his own hopeless immersion in vice. It has thus proved intensely interesting and even attractive, in spite of its realistic atmosphere of libertinism, which at least is not assumed, as in the case of a modern school of eccentric poets. Besides the two Testaments, there are a number of ballads, among which is the well-known "Ballade des Dames du Temps Jadis," with its burden of "Mais où sont les neiges d'antan."

Vil'na (Polish, WILNO), capital of the general government of Vilna, Russia, and a great railway center; on the Wilija, 436 m. SW. of St. Petersburg. It has very few manufactures, but an extensive trade in grain and timber. Vilna was the capital of Lithuania from 1323, when the Lithuanian state extended from the Baltic to the Black Sea, and is rich in historical monuments and associations. Its university, founded in 1576, was suppressed after the Revolution of 1830; but a medical academy and an astronomical observatory still exist. The Cathedral of St. Stanislaus contains the silver sarcophagus of St. Casimir. Vilna's scientific societies are among the most noted in the Slavonic world. Pop. (1900) 162,633, chiefly Polish.

Vinci (vĭn'chē), **Leonardo da.** See LEONARDO DA VINCI.

Vine Cul'ture. See GRAPE.

Vine Fam'ily, or **Grape Family,** group (435 species) of woody plants, mostly climbing. They are most numerous in the tropics; twenty species are natives of N. America. Many species of *Vitis*, the grape, are grown for their delicious berries. The Virginia creeper of the U. S., and the Japanese creeper of E. Asia and Japan, are well-known ornamental climbers.

Vin'egar, a dilute solution of acetic acid, mixed with small quantities of sugar and other organic and vegetable matters, produced by the oxidation of alcoholic solutions. The oxidation is effected by an organism called *Mycoderma aceti*, which acts as the oxygen carrier in the reaction. The tough gelatinous mass often found in the vessels used in the manufacture of vinegar, and known as mother of vinegar or vinegar plant, is a distinct ferment, which, like the *M. aceti*, has the power to convert alcohol into vinegar. To make vinegar, the alcoholic fluid should not contain more than twelve per cent of alcohol; the temperature should not be much below 70° F.; air (oxygen) should be supplied in abundance. In France and Germany the greater part of the vinegar is made from inferior grades of wine; in England infusions of malt and soured beers are employed; while in the U. S. cider and alcoholic liquors are largely used.

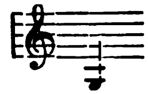
Vin'land, that part of the coast of N. America which was visited by the Norsemen in 1000 A.D. Bjarne Herjulfson saw this country in 986, when he was on his way to Greenland, but did not land. Fourteen years later Leif Ericson made an expedition thither, and from the abundance of grapes there, named the country Vinland. The oldest evidence of the discovery of Vinland is that given by Adam of Bremen in his book, "On the History of the Bremen Church and on the Geography of the Countries of the North." He enumerates the islands of the sea N. and W. of Norway, and among them he mentions Greenland and Vinland. Iceland's oldest historian, Ari the Wise, who wrote about 1120–30, speaks of the discovery of Vinland, and he got his information from his uncle, Thorkel Gelleson, at Helgafell, who in his youth, 1060–70, had lived in Greenland, and had there gathered knowledge of the discoveries, partly from an old man who had himself accompanied Eric the Red from Iceland in 986, and thus had witnessed Leif Ericson's return from Vinland.

The countries visited by Leif Ericson were called by him Helluland, Markland, and Vinland. The description of Helluland applies to Newfoundland, that of Markland to Nova Scotia, and that of Vinland to New England. Everything points to New England as the site of Vinland, probably the basin of the Charles River. The accounts given of the natives, of the corn, grapes, and fish, all apply to this locality.

Vi'ola, or **Ten'or Violin'**, a large violin, having four strings, two catgut and two wound with wire; it stands an octave above the violoncello, and is employed for playing the middle part in orchestral music. It was first used to strengthen the basses in unison or the octave. Modern composers demand from it an independent agility equal to that of the violins. Its tone has a character of melancholy as compared with that of other stringed instruments.

Vi'olet, popular name of a group of plants, of which about 100 species are known. The pansy (*Violet tricolor*) and sweet violet (*V. odorata*), both from Europe, are common in cultivation. They appear early in spring, and are popular for their purity of color as well as the fragrance of the cultivated varieties. The name is applied to some plants outside the violet family, as to the false violet, which belong to the rose family, and the dogtooth violet or adder's-tongue, which is a lily.

Violin, a musical instrument with four strings, played with a bow. It consists of three parts: the neck, the table, and the sounding board; has at its side two S-shaped apertures. Above these is a bridge, over which pass the strings from the lower extremity or tail piece to the neck, where they are tightened or loosened by means of turning pins. The violin is tuned in fifths, E-A-D-G, the lowest string (wound with wire) giving this tone:



It is the most perfect of musical instruments, on account of its capabilities of fine tone and expression, and forms with the viola, violoncello, and double bass or bass viol, the main element of all orchestras. It is of great antiquity, being traced in England to the twelfth century. The most prized instruments are those made in the seventeenth and eighteenth centuries in Italy by the Amatis at Brescia, Stradivari and the Guarneris at Cremona, and Stainer in the Tyrol. The demand for these is due not only to their perfect construction, but to a purity and fullness of tone not produced by modern instruments.

Violoncello (vē-ŏ-lŏn-chĕl'lŏ), a bass violin with four strings tuned in fifths, A, D, G, and C, the two last strings being wound with wire.

Viperidæ. See VIPERS.

Vi'pers, or **Viper'idæ**, family of poisonous snakes embracing the viper of Europe and related species. The form is typified by the common viper, or adder, the only venomous serpent of Great Britain. The family includes a number of poisonous serpents peculiar to the Old World, and is at first sight distinguishable from the *Crotalidæ* (rattlesnake, etc.) by the want of the deep pits between the eyes and nostrils which so much enhance the vicious look of the latter. The most notable species are the viper of Europe, the cobra de capello, and the Egyptian *Naja haje* and *Cerastes hasselquistii*, or *ægyptica*, each of which has been supposed to have been the asp fatal to Cleopatra.

Virchow (vėr'chow), **Rudolf**, 1821–1902; German pathologist; b. Schivelbein, Pomerania; graduated Univ. of Berlin, 1843, and, 1847, a lecturer there; sent, 1848, by the Prussian Govt. to Silesia to investigate the typhoid fever raging there; dismissed from Berlin Univ., 1849, for political reasons; Prof. of Pathological Anatomy, Univ. of Würzburg, 1849–56; in 1852, sent by the Bavarian Govt. to the Spessart to investigate a famine fever which had broken out there; returned to the Univ. of Berlin, 1856, and acted as director of the hospitals during the campaigns of 1866 and 1870–71, taking part with energy in the political movements as a representative of Berlin in the Prussian House of Representatives. He is the creator of the cellular theory in pathology, which is a biological principle establishing the fact that the laws working in disease are not different from those in operation in health, but that they are subject to different conditions. He also wrote "Handbuch der speciellen Pathologie und Therapie" and "Vorlesungen über Pathologie," besides many minor essays. He was one of the most earnest advocates in Germany of sanitary reform, and put forth an immense amount of effort to attain it. For more than twenty years he was one of the aldermen of Berlin, and his liberalism in politics exercised a potent influence in practical municipal work.

Vir'eo, one of the family of birds belonging to the *Vireonidæ*, and related to the shrikes. The bill is much compressed, decurved at the end and notched. The nostrils are lateral and overhung by membrane; the frontal feathers are bristly and erect, or bent slightly forward; the wings have mostly ten primaries, but the spurious one is wanting in certain Vireos; the tarsi have the lateral plates undivided, except at the extreme lower ends, and they are longer than the middle toes with the claws; the three anterior toes are extensively attached to one another. The family is peculiar to America, and comprises about fifty species of small singing birds.

Virgil (vėr'jĭl), **Publius Virgilius**, or **Vergilius, Maro**, 70–19 B.C.; Roman poet; b. Andes, near Mantua. He received his early education at Cremona and Mediolanum (Milan), studied Greek at Naples under Parthenius, and afterwards seems to have retired to his father's estate near Mantua. Asinius Pollio was one of the first to recognize his poetical talent. He was afterwards befriended by Mæcenas, and became a favorite of Augustus; but, being of a retiring nature and delicate health, he spent the latter part of his life mostly at Tarentum or Naples. In 19 he went to Greece, returned with the emperor, and died on the journey. The earliest works of Virgil were the Bucolics, or Eclogues, written probably between 43 and 37. The Georgics form a didactic poem in four books, addressed to Mæcenas, and are by far the most finished of Virgil's productions, the monotonous details of agricultural life being embellished with apt allusions, skillful ornament, and beautiful digressions. His great epic, the "Æneid," or the adventures of Æneas after the fall of Troy, is in twelve books, the first six of which were modeled after the "Odyssey," and the last six after the battles of the "Iliad." Virgil worked at this poem for ten years, but he did not live to perfect it. He bequeathed it to his friends Varius and Tucca, who at the wish of Augustus edited it with the utmost care. Other poems attributed to Virgil are "Culex," "Ciris," "Copa," "Moretum," and fourteen "Catalecta." His influence on Roman literature and the literature of the Middle Ages was almost without a parallel in literary history.

Virgin'ia, or **Verginia**, a Roman maiden, daughter of Lucius Virginius, a patrician, and betrothed to Lucius Icilius, a popular democratic leader who had signalized himself in the office of tribune by procuring the passage of the law assigning the Aventine Mount to the plebeians. According to the ordinary histories—which, however, do not merit great confidence—the decemvir, Appius Claudius, captivated by the beauty of the maiden, devised with one of his clients a plot to obtain possession of her, under pretense that she was a slave; and when, in spite of all the efforts of the maiden's father and lover, the decemvir had in his magisterial capacity adjudged her to be the slave of his accomplice, Virginius, in the midst of the Forum, plunged a knife into his daughter's breast. The people, excited by this tragedy, overthrew the decemvirs, reestablished the consulate, and made Virginius tribune, by whom Appius was thrown into prison, where he committed suicide (449 B.C.).

Virginia (named in honor of Elizabeth, the "virgin queen"), one of the U. S. of N. America; the tenth of the thirteen original states that ratified the Federal Constitution; popularly called the OLD DOMINION STATE and the MOTHER OF PRESIDENTS. On the S. it adjoins N. Carolina for 326 m. and Tennessee for 114 m.; on the W. and NW. it adjoins Kentucky for 115 m. and W. Virginia for 450 m.; on the NW. and N. it is separated from Maryland by the Potomac River and Chesapeake Bay for 205 m., and by a line of 25 m. across the E. shore; and E. and SE. it is bordered by the Atlantic for 125 m.; area, 40,125 sq. m.; pop. (1910) est. at 2,100,000.

There are six natural divisions of Virginia, extending across the state from NE. to SW., nearly parallel to each other, and corresponding to the trend of the Atlantic coast on the E. and the Appalachian Mountains on the NW. In the Tidewater country every portion is penetrated by the tidal waters of the Chesapeake Bay. The Middle Virginia region is a great, moderately undulating plain from 25 to 100 m. wide, rising to the NW. from an elevation of 150 to 200 ft. above tide at the rocky rim of its E. border to 300–500 ft. at its NW. In the Piedmont section the mountains gradually sink into the plains, giving great diversity and picturesqueness. The Blue Ridge country for 310 m. is embraced in the Valley and Piedmont cos. that have their common lines upon its watershed; the SW. portion, a plateau, with an area of 1,230 sq. m., forms a separate political division. The Great Valley is a continuous one, clearly defined by the surrounding mountains, but it is really the valley of five rivers. These with their lengths are from the NE.: The Shenandoah, 136 m.; the James, 50 m.; the Roanoke, 38 m.; the Kanawha or New River, 54 m.; and the Holston or Tennessee, 52 m. The Appalachian country succeeds the Great Valley on the W., and is traversed its whole length by the Appalachian Mountains. It is a series of long, narrow, parallel valleys.

The only lake in the state is Lake Drummond, in the SE. (Dismal Swamp). The prin-

cipal stream is the Potomac, with its large branches, the Shenandoah and the S. Branch, and its smaller ones, Potomac Creek, Occoquan River, Broad Run, Goose, Catoctin, and Opequon creeks; the Rappahannock, with the Rapidan and numerous other branches, flows from the Blue Ridge; the Plankatank drains a portion of Tidewater; and Mobjack Bay and its rivers furnish deep entrances to the Gloucester peninsula. The York, with its Pamunkey and Mattapony branches and many tributaries, flows through Middle and Tidewater country. The James, with the Chickahominy, Elizabeth, Nansemond, Appomattox, etc., drains more of the state than any other river. The Elizabeth is a broad arm of the Hampton Roads estuary of the James, extending for 12 m. All these flow into Chesapeake Bay. The Chowan, through its Blackwater, Nottoway, and Meherrin branches and their affluents, waters portions of Middle and Tidewater Virginia. The Roanoke, called the Staunton from the mouth of the Dan to the Blue Ridge, receives the Dan, Otter, Pig, etc., from the Valley and Piedmont and Middle Virginia, and then flows through N. Carolina to Albemarle Sound, joining the Chowan. The waters of the Ohio system drain one seventh of the state. The principal streams are the Kanawha or New River, which rises in N. Carolina, flows through the plateau of the Blue Ridge, and through W. Virginia into the Ohio. The Holston drains the SW. portions of the Valley and Appalachia; and the Clinch waters the extreme SW. of the Appalachian country. These flow into the Tennessee. Mountains extend W. from the foot of the low broken ranges that cross the state SW. from the Potomac to the N. Carolina line, forming the E. outliers of the Appalachian system. The Blue Ridge, where the Potomac breaks through, attains an elevation of 1,450 ft.; Mt. Marshall is 3,369 ft.; Rockfish Gap 1,996 ft. The peaks of Otter, in Bedford Co., are 3,993 ft. and the Bakam Mountain, in Grayson, is 5,700 ft. The ranges W. of the Great Valley are called the Appalachian, Kittany, or Alleghany Mountains. Many are bold, but only one peak, Elliott's Knob, vies with the peaks of the Blue Ridge. Vast caves, natural bridges, and waterfalls alone repay the tourist for an extended trip.

The mineral resources are, in Tidewater Virginia, marls, greensand, etc., esteemed as fertilizers, choice clays, sand, and shell limestone; in the Middle section, granites, gneiss, brownstone, sandstone, brick and fire clay, soapstone, marble, slate, limestone, gold, silver, copper, red and brown hematite, magnetic and other ores, and bituminous coal; in Piedmont, granite, marble, sandstone, brick and fire clays, limestone, hematite, magnetic and other iron ores, barytes, lead, and manganese ores; in the Blue Ridge district, copper ores, red and brown hematite, and other iron ores, greenstone, sandstone, freestone, glass sand, manganese ores, and brick and fire clays; in the Great Valley, limestone, marble, slates, freestones, sandstones, brick and fire clays, kaolin, hematite, lead and zinc ores, tin ore and semianthracite coal; in the Appalachian country limestones, marbles, freestones, slates, calcareous marls, brick clay, red, brown, and other iron ores, salt, and bituminous coal. In Middle Virginia, Piedmont, and Great Valley divisions are choice mineral waters.

In Tidewater the soil of the low, flat, sandy shores is thin, light, and soft; but warm and under the influence of a mild climate. The second bottoms (a second terrace above the water) are the rich lands of the country. Along the streams of the Middle country there are rich soils in the bottom lands. The red and chocolate soils of the Piedmont division formed from the decomposed dark greenish-blue sandstone are the most fertile. The Blue Ridge is composed of much the same material as the Piedmont, but it is richer in greenstone rocks, which adapt it for rich grasses, vines, and orchards. The soils of the Great Valley, generally limestone, are well adapted for grass and grain.

The forests are large and the timber is varied, including several species of pine, oak, hickory, elm, poplar, willow, beech, birch, walnut, maple, cedar, mulberry, locust, sycamore, and other timber trees, besides the juniper, chestnut, cypress, mulberry, linden, catalpa, persimmon, cottonwood, dogwood, sassafras, numerous nut trees, and many fruit trees.

The crops in the order of value are: corn, hay, tobacco, wheat, potatoes, oats, buckwheat, and rye. The cotton crop in 1907 was 4,400,361 lb., valued at $504,281.

In 1907 the production of coal was 4,710,895 short tons. Virginia and W. Virginia together had in 1903 an output of 953,128 long tons of brown hematite iron ore, 31,677 tons of red hematite, and 3,153 tons of magnetite. The two states combined ranked second in production of brown hematite, seventh in magnetite, and eleventh in red hematite. Other productions were: Granite, sandstone, slate, principally for roofing; limestone, cement, natural rock, talc, and soapstone. The clay-working industries produced brick and tile valued at $1,573,842. There were forty-eight mineral springs reported.

The climate ranges from the temperate of the plains in the SE. to the cold of the NW. mountain plateaus, is generally dry and mild, and is healthful the year round. The mean annual temperature for twenty years is 57°. The mean annual average of rainfall for twenty-one years (1872–92) was 42.99 in.

For administrative purposes Virginia is divided into 100 counties and 18 independent cities. Principal cities and towns: Richmond, Norfolk, Petersburg, Roanoke, Newport News, Lynchburg, Portsmouth, Danville, Alexandria, Manchester, Staunton, Charlottesville, Winchester, and Fredericksburg.

In 1905 the census returns showed that 3,187 manufacturing establishments reported. These had a combined capital of $147,989,182, employed 85,255 salaried officials and wage earners, and had an output valued at $148,856,525. The principal manufactures were of flour and grist, lumber, tobacco, railway cars, leather, tanning, iron and steel, fertilizers, textiles, printing and publishing. The schools are free; white and colored children are taught in separate schools. The universities and colleges of liberal arts are the state university; Hampden-Sidney College, at Hampden-Sidney; Washington and Lee Univ., at Lexington; Randolph-Macon College, at Ashland; Richmond College, at Richmond; Roanoke College, at Salem; Emory and Henry College, at Emory; and the Polytechnic Institute, at New Market. State aid is given to the state university, the Virginia Military Institute, the Virginia Agricultural and Mechanical College, the State Female Normal School, the College of William and Mary, the Medical College of Virginia, the Virginia Normal and Collegiate Institute, and the Hampton Normal and Agricultural Institute. The Miller Manual Labor School, at Crozet, has an endowment of $1,300,000.

Among charitable, reformatory, and penal institutions are the Virginia Institution for the education of the deaf and dumb and the blind, at Staunton; four state asylums for the insane—the Western at Staunton, the Eastern at Williamsburg, the Southwestern at Marion, and the Central near Petersburg; an industrial reform school for white boys, at Laurel; a penitentiary, at Richmond; and county and city jails and almshouses.

The executive power is vested in a governor, elected for four years and ineligible for a second consecutive term, who must be a citizen of the U. S., thirty years old, and a resident of the state for three years prior to his election. If foreign born, he must have been a resident of the U. S. for ten years. A lieutenant governor succeeds the governor on his death or removal from office. Other state officers are a secretary of the commonwealth and treasurer, elected by the general assembly. The legislative authority is vested in a general assembly, consisting of a senate of 40 members and a house of delegates of 100 members, each elected for two years. The elective franchise is given to all males twenty-one years old and upward who are citizens of the U. S. and residents of the state one year. A modification of the Australian ballot law is in force.

Virginia was the earliest settled of the English colonies. On May 13, 1607, a party of 105 persons, sent out by the London Virginia Co., landed at what is now known as Old Jamestown. It was mostly composed of needy adventurers, and the whole company would have perished but for the enterprise of Capt. John Smith. Smith took command of the colonists, and held it until the officers appointed by the London Virginia Co. should make their appearance. Nine vessels had been sent out by the company with 500 colonists, but the one bearing the officers was wrecked on the Bermudas, and one of the other vessels was lost. The remaining seven arrived safely at Jamestown, but the new settlers were as worthless as their predecessors. Having been severely wounded by an accident, Smith was compelled to return to England in December, 1609. He left 500 colonists well supplied. Six months later the number had dwindled to 60, and these were on the verge of starvation. At this time (June, 1610), Newport, Gates, and Somers arrived at Jamestown with 150 men and supplies, but finding the colonists in so sad a plight they resolved to abandon Virginia. As they descended the river they met Lord de la Warr with three ships, bringing supplies and settlers. They then returned to Jamestown, and Lord de la Warr established a trading post at Hampton. Lord de la Warr's health failing, he returned to England, leaving Capt. George Percy as his deputy.

New settlements were made at Henrico and at what is now City Point. The culture of tobacco became profitable; favorable laws were made; servants of two kinds began to come into the colony in 1619—felons or convicts sent over from English prisons and sold to the planters for a term of years, and negro slaves brought by Dutch vessels from the African coast. In 1624–25 the Virginia Co. was dissolved, and the colony reverted to the crown. In 1652 the colonists reluctantly submitted to the rule of Cromwell, but in 1660 they reaffirmed their loyalty to the Stuart dynasty. Bacon's rebellion, which occurred in 1676, was the result of the rapacity of Gov. Berkeley and two courtiers of Charles II (Arlington and Culpeper), to whom he had given a patent of the Virginia colony. There were occasional conflicts with the Indians, but these were not serious until 1754, when the French war began. Virginia resented the levying of taxes by the mother country without representation as warmly as did Massachusetts, and in 1765 adopted resolutions denying the right of any foreign body to levy such taxes. The colony was not represented in the first colonial congress of October, 1765, but approved its action. It was not until the accession of Lord Dunmore as governor in 1772 that the opposition to the measures of the British ministry began to be generally manifested. Lord Dunmore became at length so obnoxious by his tyranny that he took refuge on board a British man-of-war off Yorktown, and in June, 1775, was declared by the General Assembly to have abdicated his office. He later attacked with a British and Tory force several of the towns along the coast, but was driven S.

In May, 1776, a convention of delegates met at Williamsburg, issued a declaration of rights, and on June 12th adopted a state constitution. Committed thus to the Revolution, Virginia was one of the fields of the Revolutionary War, especially toward its close. Naval attacks were made on Norfolk, Portsmouth, and Gosport in 1779, and Benedict Arnold captured and burned Richmond in January, 1781. The battle of Jamestown was fought July 9, 1781, and the surrender of Cornwallis (with which the war ended) took place at Yorktown October 19th of the same year. Virginia was prominent in the national convention which framed the Constitution of the U. S., and ratified that constitution June 25, 1788. In 1784 she ceded to the U. S. her claims to the lands NW. of the Ohio, and soon after this she gave up the territory which now forms Kentucky. In 1849 she changed her constitution, extended the suffrage, and codified her laws. In 1860 and 1861 the people of Virginia were divided on the subject of secession.

The convention, called February 13, 1861, to consider the subject, was composed of three classes—unconditional unionists, unconditional secessionists, and conditional unionists; the last named were largely in the majority. There was a long discussion, but on April 17th, three days after the capture of Fort Sumter, the ordinance of secession was passed by 88 yeas to 55 nays. It was submitted to the people late in May, and a majority of 94,000 was said to have declared in favor of secession. The W. counties opposed it, and as a result the State of W. Virginia was formed, October, 1861. Richmond became the capital of the Confederate States, May 21, 1861. The state was occupied by hostile armies during the whole of the Civil War, and many of the most important actions of the war, together with the final surrender of Lee's forces at Appomattox, took place within its borders. (See CONFEDERATE STATES.) During a part of this time there were two state governments, the counties which were loyal and under Federal control having instituted a state government at Alexandria in 1863. The legislature of this state government called a convention, which met February 13, 1864, and abolished slavery. After the close of the war an attempt was made to convene the old Virginia Legislature to restore the state to the Union, but as it was believed that that legislature would act in hostility to the Government, its assembling was prohibited. The state was under military control till January 26, 1870, when it was restored to the Union. During 1878–82 there arose a contest over the state debt, which was not settled till 1892, when the debt was adjusted and bonded. In 1902 a new constitution was proclaimed, its special object being to enfranchise as many whites as possible and to reduce the colored vote.

Since the Civil War Virginia has almost continuously given a Democratic vote. Seven Presidents of the U. S. were natives of Virginia—Washington, Jefferson, Madison, Monroe, W. H. Harrison, Tyler, and Taylor.

Virginia Creep'er. See AMPELOPSIS.

Virginia Resolu'tions. See KENTUCKY AND VIRGINIA RESOLUTIONS.

Virginia, Univer'sity of, an institution of learning at Charlottesville, Albemarle Co., Va.; chartered in 1819 through the influence of Thomas Jefferson, its first rector. It was opened in 1825. The university is divided into separate independent schools, twenty-two in number, each under the charge of a professor. There is no general curriculum, but students select their schools, usually three in number, for each year, and receive upon examination their respective degrees—namely, for proficiency in separate branches, for graduation in a single school, for the degrees of Bachelor of Arts, of Master of Arts, and of Doctor of Philosophy. The university has also medical, pharmaceutical, law, agricultural, and engineering departments, with corresponding degrees. The institution is under state patronage, having an annual appropriation of $40,000 in 1884. The gifts in equipments and endowments (including an endowed observatory and an extensive museum of natural history and geology) since 1869 amount to $600,000. To this is to be added an estate in remainder left in 1884, and valued at $420,000. The department of agriculture was founded in 1869, with an endowment of $100,000. The library contains 70,000 volumes. In 1909 there were 785 students.

Vir'gin Is'lands (so called by Columbus in honor of the Eleven Thousand Virgins), a group in the W. Indies, forming the NW. extremity of the Caribbee chain, and lying immediately E. of Porto Rico. The most important are St. Thomas, Santa Cruz, and St. John, belonging to Denmark. Tortola, Anegada, Virgin Gorda, and some islets belong to Great Britain and are attached to the Leeward Islands colony; aggregate area, 58 sq. m.; pop. (1901) 4,908. Culebra, Vieques, etc., are dependencies of Porto Rico. All the islands are hilly or mountainous. Sugar and cotton are raised.

Virgin'ius Mas'sacre, The. In October, 1873, the steamer *Virginius*, carrying the U. S. flag and having on board munitions of war and recruits for the insurgents in Cuba, was captured by the Spanish warship *Tornado*, and taken to Santiago. Four leading Cuban insurgents captured on board were executed, a fate which was later shared by Capt. Frey, an American, and thirty-six of the crew and sixteen passengers. Further executions were prevented by the intervention of the captain of the British warship *Niobe*. Excitement rose high in the U. S., and war with Spain was anticipated, but the lawless character of the

Virginius was fully established, her right to carry the American flag was denied, and, upon the release of the survivors, friendly relations were restored, Spain paying a sum for the relief of the families of the victims.

Vir′gin Ma′ry. See Mary, the Blessed Virgin.

Virgin's Bow′er. See Clematis.

Virgo (vėr′gō), the sixth sign of the Zodiac, which the sun enters about August 20th; also a constellation which formerly marked this sign, but is now in the sign Libra. It is on the meridian during the evenings of May and June, and contains the bright star Spica. See Zodiac.

Virgo.

Vi′rus, animal fluids produced in diseased conditions or by morbid processes, and capable of developing disease when transmitted to other animal bodies. Thus man may be inoculated by the virus of human origin, smallpox, vaccinia of the cow, glanders of the horse, and hydrophobia. (See Inoculation and Vaccination.) A minute amount of the virus gaining access to the body is sufficient to infect the entire volume of the blood and contaminate every part of the body. Peculiar organisms, having vitality and tendency to reproduce themselves, constitute the active elements of all viruses. (See Bacteriology.) Having gained entrance to the system, they for a time seem dormant, but are really multiplying, and this period is designated as one of "incubation." Thus smallpox appears twelve or more days after admission of virus, vaccinia within a week, hydrophobia on an average in forty days. Hygienic and supporting measures may prepare the body to meet those effects and pass safely through, but, with the exception of malaria and a few other diseases, no specifics are known which are capable of destroying the virus.

Visconti (vēs-kŏn′tē), a family of rulers of Milan. Ottone Visconti became archbishop in 1262, and desperately contested with the Della Torre family the mastery of the city and territory. His nephew, Matteo I, the Great (1250–1322), obtained supreme power, was expelled by a league, and was reinstalled by the emperor, Henry VII (1310–11). Matteo extended his dominion, but the Guelphs, incited by Pope John XXIII, forced him to resign. His son, Galeazzo I (1277–1328), continued the warfare, and a papal force in 1323 burned the suburbs of Milan and many adjacent castles. With the aid of the emperor, Louis the Bavarian, the pope's troops were overwhelmed in 1324. In 1327 Louis appointed Galeazzo imperial vicar in Lombardy; but he soon incarcerated him, with his son Azzo and his two brothers, on a charge of conspiracy, and released them for a heavy ransom. Azzo (1302–39) improved the condition of Milan. His uncle and successor, Lucchino, annexed most of Lombardy and Montferrat.

Lucchino's brother Giovanni (1290–1354) extended his rule over many cities of Tuscany. He left the government to his nephews, Matteo II, Barnabò, and Galeazzo. The first soon died from poison ascribed to his two brothers. Barnabò waged war against the papal see till 1385, when he was imprisoned by his nephew, Giovanni Galeazzo (d. 1402), who expelled the Scalas from Verona and Vicenza, and the Carraras from Padua, and purchased in 1395 the title of Duke of Milan from the emperor Wenceslaus. He was a munificent patron of art, and founded the Cathedral of Milan. His son, Giovanni Maria, became duke, but lost many of his possessions, was assassinated in 1412, and was succeeded by his brother, Filippo Maria (d. 1447), who was continuously engaged in wars chiefly against Venice. He left no male heirs, and Francesco Sforza, husband of his natural daughter Bianca, secured the duchy for himself and his descendants.

Viscos′ity, a term in physics denoting that property of matter in accordance with which the relative motion of its parts tends to diminish. It is exemplified in the dying away of sound and the gradual disappearance of the waves caused by an object thrown into water.

Viscount (vī′kownt), in the British peerage, a nobleman higher in rank than a baron and lower than an earl. See Nobility.

Vish′nu, the second person of the Hindu Trimurti or Trinity. While Brahma is said to create, and Siva to destroy, the chief function of Vishnu is to preserve, for in his avatars he appears as an almighty deliverer, the last succor of gods and men. According to his votaries he stands alone, as the incomparable chief of the Hindu pantheon; but zealous advocates of Saivism are as extravagant in the praise of Siva, and declare that he is so potent that he is worshiped by Vishnu. As for Brahma, he is rather a venerated name, encircled by shadowy awe, than a living power to whom prayers and sacrifices must be offered.

Vishnu is usually represented with four hands, and as riding on the Garuda, a being half bird and half man. He has 1,000 names. His wife is Lakshimi.

The first avatar or incarnation of Vishnu was as a fish, in which form he slew the demon who had stolen the sacred writings, or vedas, while Brahma slept; he also saved the philosopher Manu and the seeds of all created things from a universal deluge, the account of which resembles in many respects the flood in Genesis. Then as a tortoise Vishnu aided to produce the ambrosia which the gods needed to make them immortal. As a boar he fought for a thousand years with a demon who had carried off the earth. Then as a dwarf he won the favor of the demon Bali, who asked him what gift he would like. "Only as much ground as I can cover by taking three steps," said the dwarf. The request was granted, whereupon Vishnu leaped up as the mightiest of the host of heaven, and placing one foot on earth, one on the middle space and one over heaven, he left hell to Bali. Hiran-ya-Ka′si-pu, having obtained from Brahma a life which could not be destroyed by any created thing, began to molest the gods and persecute the votaries of Vishnu. So

Vishnu took the form of a being which had not been "created"—that is, a new creation, a man lion, and tore the heart out of the domineering demon. Then Vishnu freed the universe from Arjuna, the warrior of the thousand arms, and again came to earth as the hero Rama.

The eighth avatar is that of Krishna (the most popular form of Vishnu), who first comes to earth as the opponent of *Kansa*, the fiend king, who terrorized over gods and men. To annihilate Kansa, he, with Balarama, determined to become incarnate. Kansa had news of this, and killed every child born as soon as he could. But by means of stratagems and concealment Krishna escaped and grew up, and after many pranks and wonderful deeds at length slew the great Kansa.

The ninth avatar is that of Buddha. It is evidently a late invention of the Jains, who tried to reconcile Brahmanism with Buddhism. The last avatar is yet to come, when the great god with the four hands, and seated on a white horse, will descend and destroy the universe. This is called the *Kalki* avatar.

The worshipers of Vishnu, known as Vaishnavas, are divided into many sects, the most important of which are the N. and the S. They wear on the forehead a mark shaped like a trident.

The N. Vaishnavas number more than 45,000,000. Two out of three Vaishnavas in Bengal are of this sect. They believe that faith in Vishnu will save more surely than works can. The virtues of pious meditation and abstraction are not to be compared to the virtues of belief. Knowledge is of little account; faith is all in all. It is good to subjugate the passions, to practice the *yoga*, to give alms, to be of a mind filled with charity, to call on the sacred name, to wear the sacred symbols on the person, to be honorable, virtuous, and meek; but faith is the sole fount of salvation. And yet these mild Hindus, who worship the Preserver, and believe that as by belief alone in the nine-times-incarnate-one they shall attain heaven, tell their brethren of the Ramanuja sect that the latter cannot be saved unless they lengthen the middle stroke on their foreheads to the tip of their noses.

The S. Vaishnavas are fond of worshiping Lakshmi, the consort of Vishnu. No Vaishnava of S. India will allow anyone to look on his food while he is eating it. A look would be pollution, and he at once would treat it as ordure, and bury it out of sight. He believes that Vishnu is the spring, center, foundation, cause, and creator of all. Matter and spirit unite in him as God and as the Incarnate. In S. India the Ramanuja Vaishnavas number many tens of millions, and their temples are among the most splendid in India.

Vis'ible Speech, a system of symbols (devised by Prof. A. Melville Bell) in which every possible articulate utterance of the organs of speech is represented. In the ordinary writing of languages the letters have no relation to the mechanism of the sounds—unless, perhaps, in the single case of O, which may be held to be pictorial of the rounded aperture of the lips. In the system of letters called visible speech every letter, as well as every part of every letter, is organically significant. For instance, all consonants are represented by *curves* which have the outline of the organs they symbolize. Thus:

ᑕ, back of tongue. ᑌ, point of tongue.
ᑎ, top of tongue. ᑐ, lips.

These curves all imply emission of compressed breath over the organ symbolized. Thus:

Ɛ, German *ach*. ω, English *r* in *road*.
ო, English *y* in *yes*. Ɜ, German *w* in *wie*.

The system is designed especially for teaching speech to mutes, as well as to enable a foreign pronunciation to be gained from books.

Vis'igoths. See GOTHS.

Vi'sion. See EYE.

Vision, Defects' of. See ASTIGMATISM; BLINDNESS.

Visita'tion Nuns, religious order established, 1610, at Annecy, Savoy, by St. Francis de Sales and St. Jane Frances de Chantal; received papal approbation, 1626; introduced into the U. S., 1808, by Teresa Lalor. The order has convents in the U. S. and in Europe.

Vis'tula, a river of central Europe and the principal river of Poland. It rises in the Yablunka Mountains, in Austrian Silesia, 3,600 ft. above sea level, traverses Galicia, Russian Poland, and Prussia, and enters the Baltic Sea by several mouths. The main stream divides into two branches, which flow into the Gulf of Dantzic (Polish *Gdansk*) at Weichselmünde and the Frisches Haff respectively. The length of the Vistula is 650 m., and it is navigable at Cracow for small vessels, and after it is joined by the San for large vessels. It is connected on the W. by the Bromberger Canal with the Oder, and on the E. with the Dnieper and the Niemen. The Vistula is the great artery of trade for Poland, passing the large cities of Cracow, Sandomierz, Warsaw, Modlin, Plock, Thorn, Kulm, Graudenz, Marienburg, and Dantzic.

Vi'tal Statis'tics, statistics of births, deaths, and marriages; sometimes including also those of physical or mental disability and disease, especially as collected and recorded under the auspices of the state. Also, the scientific discussion of data of this kind; "the science of numbers applied to the life history of communities." Some governmental bodies collect and record vital statistics with great care; others are careless or fail to gather them at all. In the U. S. the collection of such data is the business of states and municipalities, with the result that they are very unevenly recorded in different parts of the country.

Conclusions drawn from vital statistics are averages relating to groups of persons, or they may be regarded as the mathematical expression of chances. They are often expressed as ratios, such as death rates, birth rates, and marriage rates. If such rates are used for purposes of comparison, care should be taken that the efficient conditions are the same. It is not fair, for instance, to conclude from a larger death rate that a place is exceptionally unhealthy before examining the proportions of persons of different ages to see whether they are normal. It might be, for instance, that, by reason of the migration of young men, the population consisted of an abnormally large number of elderly persons. It is related that a statistician, comparing the average age of clergymen at death with the same figure for the total population and finding it larger, concluded that clergymen were exceptionally healthy. Such a comparison is of no value, because no clergyman is younger than (say) twenty-five years, and therefore cannot die at an earlier age than this. Mistakes of this kind, often not so palpable, are easy to make in discussion of vital statistics. Although the U. S. does not directly collect and record vital statistics, it does directly enumerate population once in ten years, by means of a census, and calculates and discusses in the publications of the census, data gathered from such collections as are made by states and cities.

It is important, of course, that the results of a census shall be comparable in detail with all records of this kind, especially in area, age, sex, race, marital condition, and occupation. That is, for instance, if we are to calculate the birth rate for a given region, we must have the number of births in that region for a specified time and the average population for that time. It will not do to compare the births between 1890 and 1900 with the population in either of these years. The average is usually obtained by using the annual ratio of increase; it is not the arithmetical mean, unless this increase has been steady during the period, which is rarely the case. The details noted above are, unfortunately, not the same for the Federal census and for the collection of vital statistics. Areas, for example, are not those that the student most desires to take into account, for he cares not so much about political divisions as he does for regions marked off by altitude, drainage, character of population or of habitations, etc. Statistics are not gathered separately for different races, except in special instances, so that although we may ascertain the number of immigrants of a given race in a given region, we may not be able to compare their birth, death, or marriage rates with those of other races. For these reasons, among others, the general vital statistics of the U. S. are not so complete or so valuable as those of many European countries. See MORTALITY.

Vi'tascope. See MOVING PICTURES.

Vitel'lius, Aulus, 15–69; Roman emperor; b. Rome; was a great favorite with Caligula, Claudius, and Nero, who bestowed the highest offices and greatest honors on him, although he was a man of sluggish and profligate character and quite without ambition; sent to Germany, and there proclaimed emperor by the soldiers, 69; entered Rome at the head of an army of about 60,000 soldiers, but found only indifference or treachery; tried to negotiate, but failed, and was found hiding in a corner of the deserted palace, dragged out into the Forum, and put to death by a common soldier.

Viti' Is'lands. See FIJI ISLANDS.

Vit'riol, Oil of. See SULPHURIC ACID.

Vitto'ria Colon'na. See COLONNA, VITTORIA.

Vitto'rio Emanuel'e III. See VICTOR EMMANUEL III.

Vivien de Saint-Martin (vē-vyăṅ' dė săn-mär-tăṅ'), **Louis,** 1802–97; French geographer and author; b. St.-Martin-de-Fontenoy. He early engaged in literature as a profession, removing to Paris; his first publication was a "Carte Electorale," 1823, and his second an atlas, one of the best of its time, 1825. In 1845 he became editor of the *Nouvelles Annales de Voyages,* and was thus able to devote his time to his favorite geographical studies. A great work, the "Histoire universelle des découvertes géographiques des nations européennes," was planned, but was interrupted by the Revolution of 1848, after two volumes had appeared. It was followed by several important works on historical geography, the latest being "Histoire de la géographie et des découvertes géographiques" (with atlas, 1873). From 1863 to 1876 he edited the *Année géographique,* relinquishing it to direct the "Nouveau Dictionnaire de géographie universelle," a monumental work. After two volumes had been published he resigned the editorship to Rousselet.

Vivisec'tion, literally, the "opening of the living body," in contradistinction to that of the dead body (*sectio cadaveris*). The examination of the interior of the dead body, both in animals and in man, is resorted to for purposes of anatomical research, and also to ascertain the changes produced by disease. Vivisection is employed for investigating, in the lower animals, the action of the organs during life. The term is used to designate all experiments of a scientific nature performed upon living animals, whether they consist of division of the parts by cutting or their compression by ligatures, or the subjection of the animal to special conditions of food, temperature, or respiration, or to the action of drugs and medicines. In all these cases the object of the experimenter is to ascertain some fact in physiology or pathology which cannot be otherwise investigated.

The necessity for resorting to experiments upon living animals in physiology and the allied sciences depends upon the obvious fact that these sciences have to deal with the actions and phenomena of life, and, consequently, in order to study them successfully, the necessary investigations must be made while life is going on. Examination of the dead body reveals the form and structure of the internal parts, but it does not yield a knowledge of their physiological actions, because these actions have ceased. Where the necessary steps of an experiment are of a nature to cause pain to the animal, as in cutting operations, this is generally avoided by the use of ether or chloroform, in the same manner as when these anæsthetics are administered for surgical operations upon the human subject. Pain, to a great extent, vitiates the results of most experiments, so that the investigator is naturally led to adopt every possible measure to prevent it. The results which have been attained by means of experiment upon the living body constitute nearly the whole of the actual knowledge possessed in physiology, of the action of medicines, and of the germs that cause disease. Among the more important facts learned by vivisection are the nature of the arteries, the possibility of the transfusion of blood, the function of respiration, and a knowledge of the details of the nervous system which enables the physician to learn from an external symptom what is the nature of the internal injury and where it is located. It has also produced results of value in other directions, among which may be mentioned the practice and usefulness of artificial respiration in cases of drowning, hanging, suspended animation of newly born infants, and in poisoning; the improved surgical operation for the cure of aneurism; the successful study of the various digestive secretions; the investigation of infectious and contagious diseases; the best treatment for venomous wounds, like those of the rattlesnake; and the action of poisons, drugs, and medicines, with their uses in disease and their antidotes. Moreover, the enormous advances in recent years in brain surgery, abdominal surgery, the pathology and treatment of disease, etc., have been wholly or largely due, directly or indirectly, to the results of vivisection. It is only by such means that we can hope for radical and rapid advances in medical science.

Vizier (vĭz'yėr), Arabic, "bearer of burdens," the title of many high dignitaries in Mussulman countries; first conferred by Abul Abbas, the first Abbasside caliph, on his prime minister, 752. In the Ottoman Empire since 1327 the grand vizier has been the representative of the sultan in temporal affairs and the chief minister of state. Alaeddin (d. 1359), elder brother of Sultan Orkhan, was the first Ottoman grand vizier.

Vladivostok (vlä-dĕ-vŏs-tŏk'), "the ruler of the east," capital of the Primorskaya, or Coast Province, in E. Siberia, and the chief naval station of Russia on the Pacific coast. The town is on the N. shore of the hilly peninsula of Muraviev-Amursky, which is called by the Russians the Golden Horn. Its harbor on Golden Horn Bay, with a depth of from 5 to 13 fathoms, is protected from wind and breakers by the opposite island of Dundas, and is spacious enough to hold a large fleet; but a crust of ice forming along the shore in December keeps vessels icebound for over a month. The town was founded in 1861, and became a naval station for the Siberian fleet in 1870. The naval workshops were transferred at that time to Vladivostok from Nikolaĭevsk, and large machine shops for steamers, repair shops, and docks established. Vladivostok became the terminus of the overland telegraph line via Irkutsk and Kiachta, and is connected by a cable with Nagasaki (completed 1871) and Shanghai. The Great Siberian Railway gives Vladivostok an international importance and, as the port for vessels carrying freight to and from Japan and the U. S., a degree of commercial prosperity heretofore impossible. Pop. (1901) 38,000.

Voice, the capacity to produce sounds uttered from the mouth; articulate voice, the organ of language, the vehicle of thought and feeling, belongs to man alone. The methods by which the intellectual attainments of any one member of the human family may thus become the possession of all are speaking and singing. It is found that in giving forth the lowest tones of what is called the *chest voice* the windpipe is enlarged to its utmost capacity, the vocal cords are moved throughout their whole length with large, loose vibrations, which are communicated to all the interior parts of the larynx, and, by resonance, to the confined air in the cavity of the chest. As the scale is ascended the vocal cords swiftly meet and separate at each new tone, and are shortened and made more tense.

The division of the vocal scale into registers (chest voice, head voice, falsetto, etc.), their points of transition, and the treatment of the singing voice with regard to them, about which a wide difference of opinion exists, are less important in elocution, because the scale employed is more limited, little beyond the lower and a part of the middle register requiring cultivation, and that of a simpler character. Men speak (normally) an octave lower than women, employing usually only the chest tones, rarely the head tones, and never the falsetto. The usual range of the male voice is from the low F to A. Women use mostly the upper part of the chest register and the lower part of the falsetto, ranging from A below the line to B in the treble clef. Little children speak entirely in the falsetto.

The upper part of the chest register—that is, the middle voice—is best adapted to public speaking, being most capable of inflection, farthest of reach, and most easily sustained. If the voice is pitched too high, when excitement supervenes it will tend to break into a scream, while for low-keyed voices it is usually very difficult to rise out of a tedious monotony. The middle voice gets all the advantage from chest resonance, and at the same time has room to rise or fall when emotion or occasion demands. The accomplished speaker should have full control over the pitch of his voice, and be able to modulate its key at will, so as to adapt it to all external circumstances. The increase of the compass of the voice is not so important in elocutionary as in musical instruction. A judicious practice of the scale under the guidance of a skillful master will accomplish all that is necessary in this respect, and at the same time tend to improve the voice in flexibility and purity.

The most important thing to be considered in the culture of the voice is timbre or quality. All bodies and instruments employed for producing musical sounds give forth, besides their fundamental tones, certain other tones due to higher orders of vibration. It is the intermixture of these with the fundamental tone which determines the *quality* of the sound. The timbre of a tone depends on the *form* of the waves of vibration; that is, on the manner in which the tone begins, the management of the breath in producing it, the direction given to the column of air which carries it, and the disposition of the anterior cavities by which it is tuned for the various elements of speech. For purity in tone, the air column from the larynx should be directed to the front of the mouth, and concentrated there above the upper teeth, whence it should rebound to form continuous vibrations in the various resonance apparatus behind. If this rebound takes place farther back, the inharmonic overtones become prominent, and various discordant qualities result. The well-known faults of vocal quality —such as nasal, guttural, husky, thin, strained, metallic—are usually due to misuse of the vocal apparatus, and may, by proper treatment, be modified or obviated. Finally, the form given to the mouth cavity, by which it is tuned for the elements of articulation, has not a little influence on the timbre of the voice.

VOICE (in music). The singing voice is divided into six classes, *viz.*, three female, SOPRANO, MEZZO, and ALTO, and three male, TENOR, BARYTONE, and BASS. The mezzo-soprano is a voice of not quite so high a range as the true or high soprano, but generally counterbalances this by a few added low notes and a richer quality in the middle range. All the various species of voice approach each other in some one direction, so that the specific name does not signify a given limit of compass as applied to each and every individual. Thus the barytone as a familiar division between true tenor and true bass is subdivided into bass barytone and tenor barytone. If we construct the mechanism of the voice as we would build an organ (to which it bears some analogy), we find at the base, in the human chest, the lungs, which perform the office of a bellows to furnish air for the instrument above. This air is forced through bronchial tubes, which, extending upward through either lung, gradually converge until they meet in a single tube, the trachea, or windpipe. At the upper end of the trachea is a funnel-shaped mechanism, enlarging upward and composed of various cartilages connected by ligaments, and moved by muscles. This is the larynx. Through its center, in continuation of the air tube, runs a passage, which terminates in a triangular opening. Across this passage are stretched two pairs of tense elastic membranes—the vocal cords. Of these, however, only the lower pair is immediately concerned in the production of tone, and are called the true vocal cords. Between their fine edges there is a narrow opening or chink, called the glottis; and as these cords are at will made more or less tense, the wind that is forced through the opening causes them to vibrate audibly with various degrees of force and pitch.

The voice now passes into the pharynx, a membranous bag which leads both into the mouth and into the nose. The curtain of the palate hangs between the pharynx and the mouth. It rises as a valve to cover the inner ends of the nostrils for purely oral sounds, and it falls to uncover the same for nasal sounds. The pharynx, together with the space between the two constrictions of the larynx—the upper and the lower vocal cords—and the anterior cavity of the mouth, with the frontal cavities over the eyes and in the cheek bones, constitutes a species of sounding board, by which the voice is modified in respect to fullness and quality.

Tone has three properties—strength, pitch, and quality. The strength of a tone depends upon the amplitude, its pitch upon the rapidity, and its timbre upon the form of the vibrations which produce it.

The pitch of a tone depends upon the number of the vibrations in a given time by which it is produced: the more rapid the vibrations, the higher the pitch. Variations of pitch in the human voice are due exclusively to the action of the glottis and the ligaments of the larynx. By means of the laryngoscope the movements of the larynx and vocal cords have been inspected and recorded.

Volapük (vōl-ă-pŏk′), "world's language," an artificial language invented by a clergyman, Johann Martin Schleyer, of Litzelstetten, Baden, and given to the public in 1879. It first spread to Austria, and was also studied extensively in Holland, Belgium, and especially France, but was not so successful in English-speaking countries. Its purpose was to facilitate ordinary intercourse between peoples of various tongues by affording a linguistic medium purged of all the irregularities and inconsistencies which characterize natural or traditional speech. Basing in general upon the English, it sought to utilize the convenient uniformity of the agglutinative type of languages, especially in regard to word formation. The number of those who have studied the language has been estimated at over 200,000, and there have been many periodicals devoted to the interests of Volapük, and printed in that language.

The sounds of letters have in general their familiar continental values, but *c* = English *j* in *joke*, *h* = German *ch* in *ach*, *j* = English *sh* in *she*, *v* = English *w* in *wet*, *y* = English *y* in *yet*, *z* = English *ts* in *hats*. The sound *h* is denoted by the Greek rough breathing, as '*ap*, harp; *c'* = English *ch* in *child*. Words are accented on the final syllable.

Words are formed from monosyllabic roots which themselves often serve as words. Derivatives are formed by the use of prefixes and affixes of constant value, possessing entire monopoly of their office. Thus:

not, information.
notik, public.
notŏn, announce.
notel, informer.
notam, N. B.
notad, publication.
noted, remark.
pen, peu.
penik, feathered.
penŏn, to write.
penel, writer.
penam, the writing.
penad, writing.
pened, letter.

lab, possession.
labik, mighty.
labŏn, possess.
label, possessor.
labam, the taking.
labed, property.
jep, herd.
jepik, in flocks.
jepön, to watch.
jepel, shepherd.
jepam, protection.

The prefix *lu*- indicates weakened or debased quality; thus *sanel*, doctor; *lusanel*, quack;

vok, sound, voice; *luvok*, shriek; *man*, man; *luman*, rascal. The prefix *le-* magnifies, as *jul*, school; *lejul*, university; *dom*, house; *ledom*, palace. Diminutives are formed by adding *-il*, as *bod*, loaf; *bodil*, small loaf; *kat*, cat; *katil*, kitten. Comparatives end in *-ikum*, superlatives in *-ikün*, as *dib*, depth; *dibik*, deep; *dibikum*, deeper; *dibikün*, deepest. Feminine names are formed from the corresponding masculines by prefixing *ji-* (pronounced *she*), as *fat*, father; *jifat*, mother; *gam*, bridegroom; *jigam*, bride; *blod*, brother; *jiblod*, sister.

The inflexion of nouns is as follows:

	Singular.	Plural.
Nom.	*buk*, book.	*buks*, books.
Gen.	*buka*, of a book.	*bukas*, of books.
Dat.	*buke*, to a book.	*bukes*, to books.
Acc.	*buki*, book.	*bukis*, books.

The pronouns follow the nouns both in formation and inflexion, thus: *ob*, I; *om*, he; *obs*, we; *oms*, they; *obik*, my; *omik*, his; *obsik*, our; *omsik*, their.

The inflexion of the verb may be illustrated by the following examples:

Present.	Imperfect.	Perfect.	Pluperfect.	Future.
löfob, I love.	*alöfob*.	*elöfob*.	*ilöfob*.	*olöfob*.
löfom, he loves.	*alöfom*.	*elöfom*.	*ilöfom*.	*olöfom*.
löfobs, we love.	*alöfobs*.	*elöfobs*.	*ilöfobs*.	*olöfobs*.

Optative (3 sing.), *löfomös*; imperative, *löfomöd*; infinitive, *löfor*; participle, *löföl*.

See Esperanto.

Volca'noes, openings in the earth from which molten lava or other highly heated substances are discharged; or mountains or hills from which such substances are or have been discharged. The typical shape of a volcanic mountain is a flat-topped cone, the tip being replaced by a cavity called a crater; but the form is often less simple. At the bottom of the crater is the opening, or vent, from which the discharges or eruptions take place. The body of the volcano is composed of erupted material which accumulates about the vent, gradually building up the conical mass.

A large part of the material discharged from a volcano is liquid or pasty, consisting of melted rock or lava. The kinds of rock which are erupted differ from the ordinary stratified or sedimentary rocks in composition and structure. They are composed chiefly of silica and various silicates, which are sometimes amorphous or glassy, but more commonly crystalline. When erupted, lava is heated, so as to be quite liquid. It flows down the slopes adjacent to the vent in a thin stream. As it flows the upper part is rapidly cooled and a solid crust is formed.

Where a series of eruptions take place from the same vent, each successive discharge flows toward the lowest tract, and in this way the country is built up evenly on all sides, the result being a conical mountain. Usually after an eruption the liquid lava retreats down the funnel, leaving a crater at the top of the cone, but it sometimes produces domelike mountains without craters.

Molten rock when subject to great pressure is able to absorb much water in the form of steam, and moisture is contained in all lavas. When much steam is present the lava is made lighter, and its upward motion is increased. Arriving at the surface it is torn to fragments by the steam, and these fragments are thrown high in the air. In the extreme case they are so fine as to constitute a dust which is floated off by the wind and descends gradually to the earth, covering a large district with a thin sheet. Usually the fragments are larger and fall to the ground near the vent, being then called cinders, or, when minute, ashes.

The cinders are thrown some hundreds or thousands of feet into the air, and on descending fall upon a circular tract about the vent. The vent itself receives no deposit, as the particles falling toward it are thrown back by the rising steam, and the accumulation is thus given the form of a ring with the vent in the center. The cratered cone thus formed is known as a cinder cone, and is one of the most frequent results of eruption. When the steam in the lava is moderate, the bubbles forming within the liquid at some distance beneath the surface gradually meet, making great bubbles which rise and burst with violence, throwing up fragments of the viscous and frothy films that surrounded them. Sometimes the steam is condensed to rain which falls on the cone, and is thus reunited with the solid discharges, constituting a mud which flows down the slopes.

Another phase of volcanic activity is exhibited when lavas rising through the crust do not actually reach the surface, but stopping at some lower point heat the water contained in the adjacent rocks far above the temperature at which, under ordinary conditions, it is converted into steam. This conversion is prevented by the weight of the overlying rocks, and also by their strength, until a large amount of energy is thus stored and concentrated. When at last the rocks above yield to the strain, and are broken, the steam is suddenly expanded, producing an explosion. The underlying rocks are torn out, leaving a crater, and the rocks which were saturated by superheated steam are torn to powder and thrown high into the air. The explosion of Krakatoa (*q.v.*) in 1883 was one of the most notable catastrophes of this class, the finer dust being carried to the upper layers of the atmosphere, where it floated for many months, producing red skies that were observed throughout the world.

From large volcanoes effusive eruption is not always over the crater rim. The pressure from the lava column and the stresses from unequal heating may crack the mountain, letting the lava escape from the flank, but eventually the cracks are sealed, and the lava again rises in the crater. Earthquakes, which often precede an eruption, are sometimes accompanied by the drying up of springs and wells. The dissipation of the heat within a volcano may produce hot springs or geysers in its vicinity. There are from 300 to 350 great habitual volcanic vents.

There are volcanoes in all the great divisions of the world; the E. hemisphere contains about as many as the W., the N. as the S. But their distribution in detail is far from equable. They are gathered in groups. More than one half the whole number constitute islands of the ocean, or occur on islands of moderate size, and of the remainder by far the greater number occur near the shores of the ocean. One of the principal belts surrounds the Pacific Ocean. The largest extinct volcanic cone in the world is that of Mount Elgon, called also Mount Ligonyi, 60 m. NE. of the Victoria Nyanza in British E. Africa, which has an elevation of 14,094 ft.

The causes of volcanic action are shrouded in mystery. Among the most probable explanations is that based on the action of gravitation. A great body of molten rock which is lighter than the earth material above is powerfully urged to change its position by rising through the upper rock and spreading over it at the surface. If a conduit is open the rising of the liquid is inevitable, and if no way is open the liquid may be able to make one. On the other hand, a liquid which is heavier than the material above has no tendency to rise through it, and will not rise even if a passage is open. If urged by stresses originating elsewhere, it will lift the ceiling of its chamber instead of passing through it. It is therefore essential to volcanic discharge not merely that the lava be liquid, but that it be relatively light. See GEYSER; LACCOLITE; LAVA; ETNA.

Vole (vōl), *Arvicola*, genus of rodents, some aquatic, others terrestrial, belonging to the rat family. They have a thick head, short ears, and short, hairy tail. Of the numerous species in the Old and the New World, the best known are the reddish-brown field mouse (*A. agrestis*) of Britain and N. Europe, the larger European water rat (*A. amphibius*), pale chestnut or black in color; the Siberian root vole (*A. arvalis*), and, in America, the prairie mouse (*A. austerus*) and meadow mouse (*A. riparius*), both often abundant and injurious to vegetation.

Vol'ga, the largest river of Europe. It rises in the marshes of the W. Valdai plateau, Russia, 550 ft. above sea level, and after a winding and tortuous course of 2,325 m., enters the Caspian Sea by some 200 mouths. Its basin covers about 563,300 sq. m. Among the hundred or more navigable tributaries of the Volga, the most important are the Oka (longer than the Rhine) and the Sura, from the right, and the Tvertsa, Mologa, and Kama, from the left. The Volga is joined to the Neva by canals, and thus connects the Caspian with the Baltic. By less important canals the Volga is connected with the Dwina and the White Sea, *i.e.*, Riga and Archangel. Among the cities built on or near its banks or within its basin are Tver, Yaroslav, Kostroma, Moscow, Nijnii-Novgorod, Saratoff, Simbirsk, Kazan, Astrakhan. The period during which the river is closed by ice lasts from ninety to one hundred and sixty days, according to climatic conditions. The chief Volga traffic is up river. Half-a-million tons of fish (especially salmon and sturgeon), salt, and naphtha are sent from Astrakhan, besides grain, flax, and other produce. The traffic down the river consists chiefly of wood and timber. The trade down river in manufactured goods is important, and is mostly distributed at Nijnii-Novgorod.

Voli'tion. See WILL.

Volt, named in honor of Count Alessandro Volta, the unit of pressure, or electromotive force (E. M. F.). It is that E. M. F. which applied to 1 ohm will produce in it a current of 1 ampère; that is, it is the E. M. F. necessary to send 1 ampère of current against a resistance of 1 ohm.

Vol'ta, Alessandro, 1745–1827; Italian physicist; b. Como, Italy; was Prof. of Physics at Como and then in the Univ. of Pavia, where he taught and studied for thirty years. In 1775 he invented the perpetual electrophore; in 1777, a lamp for inflammable gas; in 1782 the electric condenser, and finally arrived at the invention of the famous pile which bears his name. Summoned to Paris by Napoleon I, he received the gold medal of the Institute, of which he became a member in 1802. Napoleon conferred upon him the title of count and a senatorship.

Volta'ic Bat'tery and Voltaic Electric'ity. See ELECTRICITY; BATTERY, VOLTAIC.

Voltaire (vōl-tār'), **François Marie Arouet de**, 1694–1778; French author; b. Paris. In 1712 he accompanied the Marquis de Châteauneuf to The Hague, but the exposure of some scandalous relations there brought him back to Paris, where he was imprisoned as the alleged author of lampoons upon Louis XIV. In the Bastile he wrote part of his epic the "Henriade" (on Henry IV), and completed his tragedy "Œdipe," on reading which the regent released him. The tragedy was produced with brilliant success in 1718. The relations that he cultivated with the nobility exposed him to a rude insult from the Chevalier de Rohan, who had him beaten and then thrown into the Bastile when he showed himself revengeful. He was set free only on condition that he retire to England, 1726, where he became acquainted with Lord Bolingbroke and the freethinkers. On returning to Paris, 1729, he found himself a national idol. He expressed his admiration for English institutions in his "Lettres sur les Anglais." He next wrote "Brutus," and shortly after "Zaïre," 1730, which, though written in twenty-two days, was his best and most pathetic drama. He could not always repress his deistical and liberal views in his plays, and his "Lettres" were publicly burned; and he escaped arrest only by retiring to Cirey, to the chateau of the learned Marchioness du Châtelet, with whom he generally resided till her death in 1749. In 1736 he had to take refuge for a time in Brussels on account of the scandal occasioned by his "Mondain."

He visited Frederick the Great in 1740, and again in 1744 on a political mission. In the meanwhile he had written the tragedies "Alzire," "Mahomet," and "Mérope." For a while also in 1746 he removed to Paris, where he brought out new tragedies, and became an Academician and royal historiographer. In 1750 he went to Berlin, where Frederick granted him a pension of 20,000 fr., and studied with him for two hours a day. Voltaire here completed his "Siècle de Louis Quatorze," and Frederick submitted his verses and essays to his criticism. In 1755 Voltaire purchased an estate near Geneva ("Les Délices"), but quarreled with his Swiss neighbors; the publication of "La pucelle," a ribald caricature of Joan of Arc, created many enemies; and forged verses in ridicule of Louis XV and Mme. de Pompadour ascribed to him started rumors of *lettres de cachet.*

In 1762 he removed to an estate at Ferney, on French territory, but near the Swiss confines, so that he might easily escape from one country to the other. His books and his stock operations had made him enormously rich, and he spent much wealth in generous munificence. Ferney became the resort of literary men from all parts of Europe, and the "Patriarch of Ferney" was the foremost man of letters of the world. He had become the founder of a new sect of thinkers and writers, who, under the lead of Diderot and D'Alembert embodied their ideas in the great "Encyclopédie." Voltaire himself, however, was a theist, and he rebuked the philosophy of his age, which tried to banish God from the universe. In his eighty-fourth year he visited Paris, whither he carried a new tragedy, "Irène," and was received with unparalleled demonstrations of honor. Voltaire was the sovereign writer of his century. The secret of his success is to be found in those satires, tales, madrigals, letters, and epigrams, in which the whole spirit of the age saw itself expressed with inimitable vivacity, grace, point, and agreeableness. His voluminous works fill seventy volumes. By the universality and lucidity of his mind, and, in spite of its superficiality, by the unfailing flash of his wit, by his prodigious literary cleverness, he deserves his rank as first man of letters of his time and one of the most powerful contributors to the work of enlightenment and intellectual enfranchisement which was the task of the eighteenth century.

Voltam'eter, an instrument in which a current of electricity is made to pass through slightly acidulated water, and as the water is thus decomposed, oxygen and hydrogen being liberated, the quantity of electric current passing through in a given time may be ascertained in terms of the quantity of water decomposed.

Vol'untaryism, the theory and practice of the support and control of churches by the voluntary act of their adherents as opposed to support and control by the state. The theory is based on considerations drawn from Scripture, from history, and from social equity. Even under the theocratic system of the Old Testament religion presents certain voluntary aspects. And, turning to the New Testament, the whole movement of Christianity at the beginning was of the voluntary kind. It had no state support and no state control. Christ's kingdom was declared by Himself to be "not of this world," and therefore its being linked to the secular government of a country, to be enriched and guided thereby, is out of the question. Further, it is a fact of history that Christianity was more truly—*i.e.*, more spiritually—prosperous before it was endowed by the state than afterwards; that Constantine's was a fatal gift; that the union between the Church and the empire gave power to persecution; that now orthodoxy and then heterodoxy became established, and that each in turn oppressed the other through the enforcement of political laws.

Nowhere is the practice of voluntaryism exemplified as it is in the U. S. Ever since the War of Independence closed and the U. S. became separated from Great Britain religion has been left for its support to the offerings of Christian people.

Volunteer'. See MILITIA.

Volunteers of Amer'ica, an evangelical association incorporated in New York City in 1896 by seceders from the Salvation Army. Among its declaration of principles is one providing that "all properties, real estate and personal, of the Volunteer movement shall be held by a body or board composed of five to seven well-known and responsible American citizens." The constitution, which is made up of nineteen articles, primarily declares that "The Volunteers of America is a military movement, military in its methods, organized for the reaching and uplifting of all sections of the people." The commander in chief is elected by the soldiers, and holds office for ten years unless removed by a three-fourths vote of the Grand Field Council.

Within the first year of the existence of this association it numbered 140 posts, 400 commanding officers, 50 staff officers, 3 regiments, and 10 battalions, its headquarters being in New York City.

Vom'iting, a reflex contraction of the muscular coats of the stomach, ejecting its contents. It is an involuntary and spasmodic act, but when begun may be aided by effort. The contraction of the stomach and vomiting may be the result of disease of the brain, of the pneumogastric nerve, of the walls of the stomach; it may be the result of indigestible food, bile, or mucus in the stomach, or a reflex result of disease in other organs, as the liver (see STOMACH). At the onset of vomiting the face may be deathly pale; the surface becomes cool and bathed with clammy sweat; the pulse small and feeble; and great prostration results. Faintness may occur, or even fatal syncope. A person vomiting should have his clothes loose, the air in the room should be fresh, and cold water should be poured on the face if needed. Stimulants are sometimes necessary to counteract collapse. Ice, carbonic-acid water, creosote, oxalate of cerium, and dilute hydrocyanic acid are useful remedies to allay vomiting. See NAUSEA.

Von'del, Joost van den, 1587-1679; Dutch poet. He is the most celebrated Dutch poet and dramatist. His works include metrical translations of the Psalms, of Virgil, and of Ovid, satires, and tragedies, including "Lucifer," from which Milton is thought to have borrowed.

Vortum'nus. See VERTUMNUS.

Vosges (vōzh) **Moun'tains** (German, VOGESEN), a range on the left bank of the Rhine, partly in NE. France, partly in SW. Germany, and running parallel with the Black Forest on the opposite side of the Rhine in Baden, which they resemble, not only in direction, but also in form and geological structure. By the depression between Montbéliard and Mühlhausen they are sharply separated from the Jura Mountains, and their E. slopes toward the Rhine are steep and abrupt. But to the N. they connect with the Hardt in Rhenish Bavaria and to the SW. by the plateau of Langres through the hills of Faucilles. They are generally rounded and of a regular shape, whence they are called *ballons*, covered with forests of oak, beech, and fir, and affording excellent pastures on their tops. Ballon de Guebviller, the highest peak, reaches 4,700 ft.; Ballon d'Alsace and Ballon de Servance are not much lower. Mineral and thermal springs are numerous, and copper, iron, and lead ores and rock salt abound. The Muerthe, Moselle, Saar, Ill, and Ognon descend from them.

Vote. See BALLOT; ELECTION.

Vot'ing Machines', contrivances by which voters may mechanically record their choice of candidates, and which usually also automatically count the votes. The introduction of practical voting machines was an outcome of the movement for ballot reform, which seeks independence and secrecy for the voter, and the prevention of fraud in casting and counting votes. The Australian ballot system has done much toward accomplishing all these results, but improvements appear to be possible by machine voting. Moreover, the habit of independence in voting which has been developed by the Australian system has itself generated the need for further improvement of voting methods. The separate marking of names, especially where a "split" ticket is cast, is far less simple and rapid than casting a straight party ballot. Machines help to simplify and shorten the process. The general principle underlying the several machines in actual use is that of recording or registering votes for candidates by pressing buttons, the names of all the candidates being displayed upon a face plate, corresponding in arrangement to a blanket ballot. Ballot machines can be adapted to all the variations in form of which the blanket ballot is capable.

The following are the chief advantages secured by mechanical voting: (1) Independence. The voter may be required to indicate his choice for each office separately, and, the names being all before him, it is as easy to cast a split ticket as a straight one. It may, of course, be arranged so that pushing a single button casts a full party ticket, but this is not usual. (2) Secrecy. No one can tell what vote the person is casting at the time, nor can his ballot be afterwards identified. This last has not always been accomplished by the secret paper ballots, as marks are sometimes made upon them by which they may be identified in the canvass, so that a bribed voter can give evidence of keeping his contract. (3) Simplicity of voting. Pushing a button is a simpler and more definite act than marking with a pencil. The voter cannot by mistake vote for two candidates for the same office, or so mark his vote that his intention is doubtful, as often happens with the paper ballot. There is no need of writing or pasting in names, as in the separate-party ballot system. If the voter is illiterate, he can, before voting, study the chart corresponding to the face of the ballot machine, which is usually posted outside the poll. A voter who cannot read may, by determining the relative location of the names, be sure of voting for the men he desires. Symbols or colors may be used to designate parties, as with the blanket ballot. (4) Impossibility of multiple voting. Mechanical devices prevent the casting of more than one vote by the same man, or render possible in canvassing its immediate detection. (5) Rapidity of voting. (6) Cheapness, saving largely, as it does, the cost of ballots and reducing the amount of clerical work, as well as other expenses. (7) Simplicity and rapidity of counting. Canvassing under the Australian system is complicated and slow. By the machine the votes for each candidate are automatically registered by serial numbers, so that the total can be read instantly, or they are all recorded in a row and can be rapidly counted. (8) Impossibility of fraud in counting. The complexity of the blanket paper ballot often renders it possible for corrupt election officers dexterously to change the count. This is probably impossible with the machines.

The use of voting machines has been authorized in several states, but their authorization has not been followed by their adoption. See BALLOT.

CALIFORNIA VULTURE. (For description, see next page.)

Vul'can, in Roman mythology, the god of fire, whether conceived of as a beneficent or a devastating agent, and of those arts which depend on the use of fire. The principal celebration in his worship was the Volcanalia, on

August 23d. In course of time Vulcan became completely identified—in literature and art at least—with the Greek god Hephæstus (*q.v.*).

Vulcan, a planet supposed to be revolving around the sun, within the orbit of Mercury. The planet has been looked for on many occasions, and some astronomers have believed that they saw it. But it is now fairly well settled that the supposed planet has no real existence.

Vul'gate. See Bible.

Vul'ture, any one of those birds of prey which have the head bare and feed on carrion. The vultures of the Old World and those of the New were, until recently, considered as nearly related, but the former belong in the family *Falconidæ*, while the latter form a separate family, *Cathartidæ*, which contains such birds as the condor, king vulture, and turkey buzzard. These essentially agree in habits, living for the most part on dead animal matter, and even appearing to prefer that which is putrescent, although not confining themselves to such. When an animal has died, the carcass is soon discovered by these birds, and they fly from all points of the compass. After eating to satiety, they rest in a lethargic manner near the remains of the carcass, and are scarcely able to fly, and when disturbed, generally vomit before they are able to take to wing. They are birds of bold flight and soar high in the air, scanning the ground in search of food, which they find much more by the sense of sight than that of smell. They are particularly inhabitants of the tropical and warmer parts of Asia and Africa, but some species occur in S. Europe, notably the griffon vulture, the typical species of the group and one of the largest. See also Brush Turkey and Egyptian Vulture.

W

W, the twenty-third letter of the English alphabet. The form W results from the doubling of V. First employed in mediæval times to express with Latin letters the value of German consonant -*u* (=*w*); thence it passed into middle English orthography, displacing the old English symbol *wēn*. The name "double-*u*," which has displaced the older *wēn* since the fifteenth or sixteenth centuries, is descriptive of the appearance of the symbol.

It denotes in general the consonant form of *u* (*oo*). After initial *s, t, h,* it is voiceless, as in *swell, twenty, what* (for *hwat*), *wh* being a sign for voiceless *w*. The same sound is denoted by *u* after *q*, as in *question, quality, quack*. The letter is silent before *r*, as in *wreck, wrong,* and in *sword, toward, answer, two, who, whole,* etc.

Wa'bash Riv'er, a river which rises in Grand Reservoir, Mercer Co., Ohio; flows N. to Wabash city, where it receives Big Beaver River; turning NW., it sweeps in a devious course across Indiana, and during the last 120 m. of its course forms the boundary between that state and Illinois. It is the largest N. tributary of the Ohio. It has been navigated by steamboats as far as Lafayette, Ind.; and from Terre Haute to Huntington, Ind., it is followed by the Wabash and Erie Canal. Length, 550 m.; area of basin, 31,500 sq. m.

Waco (wä'kō), incorporated 1850; capital McLennan Co., Tex.; at the junction of the Brazos (which divides it) and the Bosque rivers; 95 m. NE. of Austin. It is the principal interior cotton market of the state. Since 1889 it has had an abundant supply of artesian water of medicinal value.

The city has a large retail and wholesale trade. There are about 600 mercantile and business firms. The factories employ a capital of about $2,000,000 and about 1,500 persons. Pop. (1900) 20,686, with suburbs, 28,000.

Wadai (wä'dī), former powerful empire of the central Sudan. It lies S. of the Sahara Desert, Darfur adjoining it on the E. Bargirmi and Kanem on the W. are tributary states; area, 140,000 sq. m. This large territory was wrested from its heathen possessors by the Arabs in the seventeenth century. Its conquerors made it a powerful Mohammedan state, and extended its boundaries and influence far beyond their present limits. At the beginning of the nineteenth century the greater part of the middle and E. Sudan was controlled by the Sultan of Wadai. Much of his possessions has since been lost, but Wadai is still the most potent political influence in the central Sudan. A large part of the country is very fertile, a great number of cattle and horses are raised, and agriculture and iron manufactures are leading industries. Wara was the former capital, but in 1863 the father of Sultan Ali removed the seat of government to Abeshr, ostensibly because evil spirits had rendered the old capital uninhabitable, but really because he desired to live farther from the most powerful of the ancient nobles of the country. By convention between Great Britain and France, Wadai is now recognized as French territory. Pop. of Wadai, abt. 2,000,000; of Abeshr, 15,000.

Wade, Benjamin Franklin, 1800–78; American statesman; b. Springfield, Mass.; admitted to the bar, 1827; prosecuting attorney, 1835, to which post he was twice reëlected; state senator, 1837; president judge of Third Judicial District, 1847. As U. S. Senator, 1851–69, he was a firm opponent of slavery, and after Lincoln's election in 1860 he strongly opposed any concessions to the South. The Homestead Bill, which he had for many years advocated, passed the Senate in 1862. As chairman of the joint committee on the conduct of the war, he advocated the vigorous prosecution of the war, and favored the confiscation of property in slaves; became president of the Senate *pro* *tempore,* and acting Vice President of the U. S. on the assassination of Lincoln; and was one of the commission sent in 1871 to Santo Domingo to report upon the proposed acquisition of that island.

Wads'worth, James Samuel, 1807–64; American soldier; b. Geneseo, N. Y.; educated at Hamilton College and at Harvard Univ.; studied law in the office of Daniel Webster; admitted to the bar, but never practiced as a profession. Applied himself to agricultural affairs; received the Republican nomination for Governor of New York, 1862, but was defeated; fought in the battles of Bull Run, Fredericksburg, Gettysburg, and in the Richmond campaign was struck in the head by a bullet, which caused his death two days after being breveted major general of volunteers.

Wa'ger, a promise to pay money or transfer property upon the determination or ascertainment of an uncertain event; the consideration for such a promise is either a present payment or transfer by the other party, or a promise to pay or transfer upon the event determining in a particular way. (Anson, "Law of Contract," 173.) The early common law treated all wagering contracts as valid, but now in England wagers in which the parties have no interest are unenforceable, although not illegal. It is, therefore, only a "debt of honor." The English common-law view was adopted by the courts in some parts of the U. S., notably in New York, but throughout New England and in most of the states that view was rejected, the courts holding that wagers were inconsistent with the interests of society, in conflict with morals, and therefore illegal and void as against public policy. Nearly all of the states have statutes against every species of wager. Occasionally the legislation is very drastic, not only declaring the wager itself illegal, but making void all securities given for money lost thereon.

Wager Pol'icy, an instrument having the form of a policy of insurance, but without any legal interest held by the assured in the subject-matter of the contract or in the risk insured against. It is merely a wager between the insurer and the assured that the event referred to will or will not happen—that the ship will or will not perform her voyage, that the house will or will not burn, or that the person will or will not die, as the case may be. See INSURANCE.

Wa'ges, that which is paid for services rendered; the share of the working man in the wealth that his labor has contributed to produce. Under POLITICAL ECONOMY, the theory of wages is treated briefly.

Since the earliest colonial days rates of wages have been governed by economic laws and the conditions of business, but in those days attempts were made to establish wage rates by legislative action. Following the custom of the old country, the Massachusetts Bay Colony, in 1633, made it a rule that carpenters, masons, bricklayers, joiners, and other master workmen should not receive more than 2*s.* a day, the workman to pay his own board, but should he elect to board with his employer, then he was to receive 14*d.* a day. The rates of pay of inferior workmen in the occupations named were fixed by the constable. Skilled tailors were paid 12*d.* a day, and the poorer ones were paid 8*d.* with their living. The time of labor included the whole day, allowances being made for food and rest. An employer paying wages beyond the amounts established by law and a workman receiving extra wages were subjected to penalties. Idleness, even, was the subject of punishment. When the colonial period closed, laborers on farms were paid about 40 cents a day, butchers 33⅓ cents a day, carpenters 52 cents, ship and boat builders 90 cents, shoemakers 73 cents, and blacksmiths 70 cents. Of course the value of a day's wage then, as now, should be estimated by its purchasing power (the real "wage"), instead of by its nominal rate. To compute the purchasing power of money during the seventeenth century is a more difficult matter than to give the rate of wages. Quality cannot be compared with quality, but the conclusion must be reached that a dollar will purchase now a much larger quantity of the necessaries of life than during the colonial period, although the commonest things, those which nearly every family produced for home consumption, were quite low during the earlier period.

The commercial convulsions of 1837 and 1857 caused a depression in wage rates, and they did not fully recover prior to 1860; yet the averages for the decade from 1850 to 1860 were a decided advance over those for the decade ending in 1830. The Civil War caused great fluctuations in currency, while the financial crisis of 1873 had a powerful influence on wages, so that there were many changes. But all figures indicate a general increase in wages in all occupations during the seventy years from 1830 to 1900.

An investigation by the government showed that in the principal manufacturing and mechanical industries of the U. S. the average wages per hour in 1907 were 28.8 per cent lower as compared with the years, 1890–99, and the average hours of labor per week were five per cent lower. The retail price of the principal articles of food, weighted according to family consumption of the various articles, was 20.6 per cent higher in 1907 than the average price for the ten years from 1890–99. Compared with the average for the same ten-year period, the purchasing power of an hour's wages in 1907, as measured in the purchase of food, was 6.8 per cent greater. The following table shows for the industries, as a whole, the per cent of increase or decrease in hours of labor per week, wages per hour, the purchasing power of wages, etc., in 1907, as compared with the average for the ten years, 1890–99.

Per cent of increase (+) or decrease (−) in 1907, as compared with previous years, in hours per week, wages per hour, full-time weekly earnings per employee, retail prices of food, and purchasing power of hourly wages and of full-time weekly earnings per employee, measured by retail prices of food, 1890–1907:

Year.	Per Cent of Increase (+) or Decrease (−) in 1907 as Compared with Previous Years.					
	Hours per Week.	Wages per Hour.	Full-time Weekly Earnings per Employee.	Retail Prices of Food Weighted According to Family Consumption.	Purchasing Power Measured by Retail Prices of Food of	
					Hourly Wages.	Full-time Weekly Earnings per Employee.
Average 1890–1899....	−5.0	+28.8	+22.4	+20.6	+ 6.8	+1.5
1890.........	−5.7	+28.4	+21.2	+17.8	+ 9.1	+2.9
1891.........	−5.5	+28.4	+21.4	+16.2	+10.6	+4.5
1892.........	−5.5	+27.8	+20.8	+18.4	+ 8.0	+2.1
1893.........	−5.3	+27.7	+20.9	+15.5	+10.6	+4.7
1894.........	−4.8	+31.6	+25.3	+21.0	+ 8.8	+3.6
1895.........	−5.1	+31.0	+24.4	+23.3	+ 6.3	+ .9
1896.........	−4.8	+29.2	+23.0	+26.3	+ 2.3	−2.6
1897.........	−4.6	+28.3	+23.4	+25.2	+ 3.3	−1.5
1898.........	−4.7	+28.5	+22.5	+22.2	+ 5.2	+ .3
1899.........	−4.2	+26.3	+20.9	+21.2	+ 4.2	− .2
1900.........	−3.7	+22.1	+17.6	+19.3	+ 2.3	−1.5
1901.........	−3.2	+19.3	+15.6	+14.6	+ 4.0	+ .8
1902.........	−2.4	+14.8	+12.1	+ 8.7	+ 5.5	+3.0
1903.........	−1.7	+10.7	+ 9.0	+ 9.3	+ 1.3	− .3
1904.........	− .9	+10.1	+ 9.1	+ 8.0	+ 2.0	+1.1
1905.........	− .9	+ 8.3	+ 7.4	+ 7.3	+ .9	+ .1
1906.........	− .4	+ 3.7	+ .3.3	+ 4.2	− .5	− .9

Opposite each year in the table is given the per cent of increase or decrease (indicated by + or −) in 1907, as compared with the year specified. Thus, for example, in the third column, opposite 1890, appears + 28.4, indicating that the increase in the wages per hour in 1907, as compared with 1890, was 28.4 per cent. In like manner, in the second column, opposite 1890, appears − 5.7, indicating that the decrease in the hours of labor in 1907, as compared with 1890, was 5.7 per cent.

Wagner (väkh'nėr), **Wilhelm Richard,** 1813–83; one of the most celebrated of modern composers; b. Leipzig; received his education at Leipzig and Dresden. In 1839–41 he went to Paris and London, and composed his operas "Rienzi" and "The Flying Dutchman." The brilliant success of these operas secured him the conductorship of the Royal Opera of Dresden in 1843. He joined the insurrectionary movement of 1848–49, and was compelled to exile himself. Until his return to Germany, in 1864, he spent most of his time in Switzerland, Italy, Paris, and London. His "Tannhäuser" and "Lohengrin" appeared in 1845 and 1850, respectively. The late King of Bavaria, Louis II, became an enthusiastic and liberal patron of Wagner, and the theater at Bayreuth, especially built for Wagner, was chiefly supported from the king's purse. Here his famous tetralogy "Der Ring des Nibelungen," consisting of "Das Rheingold," "Die Walküre," "Siegfried," and "Götterdämmerung," was first performed in 1876. About a year before his death he produced his last creation, "Parsifal." In 1870 he had married, as second wife, Cosima von Bülow, a daughter of the Abbe Liszt. Wagner's theory was that in a perfect musical drama the three arts, poetry, music, and dramatic representation, should be welded together into one well-balanced whole. His particular views on music are embodied in a well-known work entitled "Oper und Drama."

Wagram (vä'gräm), a village of lower Austria; 12 m. NE. of Vienna; famous for the victory which Napoleon gained here over the Austrians under the Archduke Charles, July 6, 1809.

Wag'tail, a group of birds of the warbler family. The wagtails have the bill slender and conical, have long and pointed wings; the tail is slightly rounded, longer than, or equal to, the wings; the feathers are mostly broadest at the middle, and thence taper to the tips. The name is given in allusion to their habit of "wagging" their tail in a fanlike manner. They are active birds, at home equally in the air and on land; they fly by short, undulating courses, and emit, while on the wing, chirping notes; on the ground they run by a rapid succession of steps. The species are numerous, and peculiar to the Old World and Australia, but a few stray into N. America.

Waha'bees, called also WAHABITES, a Mussulman sect founded about 1750 by Abd-el Wahab, an Arabian reformer. He taught no new doctrine, but sought to restore Islam to its original simplicity and austerity. He denounced as superstitious the veneration paid to the memory of the prophet and to relics and tombs esteemed holy, taught total abstinence from tobacco, as well as from wine and opium, and demanded purity and frugality in life. They are the Puritans of Islam; and now probably number 1,500,000.

Waits, a class of watchmen in English and Scotch towns who formerly at certain fixed hours of the night played upon the pipe and other instruments.

Wake, in Old English usage, the equivalent of vigil. In many British parishes the term and custom still survive in the "country wakes," festivities of ancient origin which are kept up on the eves of certain saints' days. The lyke wake, in which the neighbors of a deceased person hold a watch over the dead body, is a custom of entirely different character. It is found among the lower classes in several countries, notably among the Irish.

Wake Is'land, a volcanic island in the Pacific, N. of the Marshall group; discovered by the Spanish sailor Medaña in 1568. The island was visited July 4, 1898, by the second Philippines expedition, which raised the American flag.

Walcheren (väl'chėr-ėn), island of the Netherlands, part of the province of Zealand; 11 m. long and 10 m. broad; area, 81 sq. m.; pop. 45,000; chief town, Middelburg. It is low, and protected against inundation partly by natural downs, partly by immense dikes. Walcheren is famous in military history for the disastrous expedition of the British under Lord Chatham and Admiral Strachan in 1809. It was aimed against Antwerp, and might, if successful, have roused N. Germany against Napoleon; but it was late in starting, and time was wasted in trying to reduce Flushing. Lord Chatham was incapable as a leader, and Lord Castlereagh, who had planned the expedition, failed to provide the necessary supplies. After the delay at Flushing the army was quartered on Walcheren. By the time Chatham was ready to attack Antwerp, Bernadotte had come to its assistance, and, as the British forces had been greatly reduced by disease, success was hopeless. Over 7,000 men lost their lives in the expedition, which was an utter failure.

Walden'sian Church, or **Vaudois** (vō-dwä'), the oldest Protestant church; founded by Peter Waldo, a rich merchant of Lyons, who, in 1173, sold his goods, and, after sharing the proceeds with the poor, preached voluntary poverty. His aim was to revive the fervor of the primitive Church. His followers were called "the poor of Lyons," or Sabatati, from the sabots, or wooden shoes, they wore. Waldo asserted the right of all Christians to study the Scriptures. Having been silenced by the Archbishop of Lyons, he appealed to the pope, but in 1184 he was excommunicated. His followers increased and spread to Italy and Bohemia, but especially in the valley of Piedmont, where they were subjected to repeated persecution, especially in 1655, when an army of French troops and Irish soldiers treated the people with such barbarity that England under Cromwell protested. In 1848 they were granted toleration, which has now become freedom. They number about 59,000, and have two colonies in the U. S.—one at Monette, Mo., and one in N. Carolina. The early Waldenses had the triple vow of chastity, poverty, and obedience. They worshiped God, and held the Virgin Mary in veneration. They practiced confession, but their teachers pronounced the absolution in this way, "May God absolve thee from thy sins."

Waldersee (väl'dĕr-zā), **Alfred** (Count von), 1832–1904; German soldier; b. Potsdam, Germany; entered the army in 1850 and served in the campaigns of 1866 and 1870–71. In 1881 he was made quartermaster general and deputy of Count von Moltke, whom he succeeded as chief of the general staff of the German army in 1888. He commanded the allied armies in China in 1900.

Wales, since 1282 an integral part of the Kingdom of England; area, 7,446 sq. m.; pop. (1901) 1,455,930.

The two-horned peninsula of Wales extends from Liverpool Bay to Bristol Channel, and is bounded on the W. by St. George's Channel, which separates it from Ireland. The fertile plain of Cheshire and the valley of the Severn form the natural boundary between England and the mountain region of Wales, but the present political boundary lies farther W. The Welsh hills, or Cambrian Mountains, attain their greatest height in Snowdon (3,570 ft.), close to Menai Strait, which separates the mainland from the island of Anglesey. A depression at the head of the Severn separates N. from S. Wales, and the hills of the latter are distinguished by their barrenness, their highest range being known as Black Mountains (Brecknock Beacon, 2,910 ft.), from the color of their heather. The only level tract of any extent is the Vale of Glamorgan, on the Bristol Channel, but there are many valleys distinguished for their loveliness. The coast is generally bold and rugged. At the SW. extremity of the peninsula a fiord, Milford Haven, penetrates far inland, and forms one of the most secure harbors of the British islands, although, owing to its remoteness, it is but little used. The Dee, Severn, and Wye rise in Wales, but in each case the lower, navigable course is through England, and except the Tawe, Taff, and Conway, none of the exclusively Welsh rivers is navigable. The only considerable lake is Bala. Geologically, Wales is the most ancient soil of Great Britain, and its mountains, of Laurentian, Cambrian, and Silurian rocks, reared their summits long before England emerged from the sea.

Wales is in the main a pastoral country, for of its area only twenty per cent is under the plow, while forty-one per cent consists of grass lands and nine per cent of mountain pasture. The woods cover 3.5 per cent. Coal and iron abound, Glamorganshire alone raising nearly 22,000,000 tons of the former, half of which is exported annually through Cardiff, the greatest coaling port of the United Kingdom. Lead, copper, and gold are found, and much roofing slate is exported. Among other industries, that of flannels and woolens is of importance.

The population between 1881 and 1891 increased from 1,360,513 to 1,519,035 souls, but the increase was confined to the counties of Glamorgan (increase, 175,785), Carmarthen, and Denbigh, while throughout the remainder of the principality there was a decrease. The only large towns are Cardiff, Swansea, and Merthyr Tydvil. English is the language of commerce and of culture, but Welsh is still spoken by fifty-one per cent of the population. The Church of England is still the established church in Wales, but in the greater part of the country the majority of the people have joined the various Dissenting bodies, among which the Calvinistic Methodists are the most numerous.

Wales from the most remote time was divided into a number of petty kingdoms or principalities, and only at long intervals did its tribes submit to the authority of a single ruler. Under the Romans, who established themselves in the country about 50 A.D., after the defeat of the Silures and Ordovices, Wales, or rather Cambria, formed part of the province of Britannia Secunda. After the retirement of the Romans the wars between the Welsh and the Saxons were incessant. Athelstan (925–41) imposed a tribute upon the Welsh, which they paid, however, only for a time. William the Conqueror (1066) again reduced them to obedience, and his son, William II, settled the Lords Marchers along the borders of Wales to protect England against their incursions, and founded a Flemish colony in Pembrokeshire. On the accession of Edward I (1272) the Welsh prince Llewelyn (Llywelyn ap Gruffydd) refused to do homage; but, after the betrayal and murder of that prince (1282), the nobility of Wales submitted to the king, and Wales was finally united with England, the title of Prince of Wales being bestowed upon the king's infant son, then recently born at Carnarvon Castle. The last effort of the Welsh to recover their liberty was made in 1400 under the leadership of Owen Glendower (Owain Glyndwr), a descendant of the old princes. Since 1546 Welshmen have enjoyed all rights of Englishmen.

Walhal'la, or **Valhalla,** a marble temple of fame, built to commemorate the wars between Germany and France which ended with the downfall of Napoleon I in 1815. It was begun in 1830 and finished in 1842. It stands on a hill on the Danube, at Donaustauf, a few miles below Regensburg. It was conceived by Louis I of Bavaria and planned by Leo von Klenze. It is a copy of the Parthenon, 232 ft. long, 110 ft. wide, and 63 ft. high. Visitors ascend by marble steps from the foot of the hill, and the substructure and surroundings greatly enhance the grandeur and beauty of the building proper. This temple was made for busts and statues of all the great men and women produced by Germany. It now contains 163 busts, and also a number of marble tablets giving the names of persons of whom no reliable portraits could be procured. It is one of the most remarkable buildings in all Germany.

Walk'er, William, 1824-60; American adventurer; b. Nashville, Tenn. He was a journalist in New Orleans and San Francisco, and practiced law in Marysville, Cal. In July, 1853, he organized an unsuccessful expedition for the conquest of Sonora. On June 11, 1855, he landed at Realejo, Nicaragua, with sixty-two followers, was joined by a few natives, took possession of the city of Granada on October 15th, and was made generalissimo. Recruits came from the U. S., and on March 1, 1856, Walker had 1,200 men. After a short war with Costa Rica, he broke up the interoceanic transit route by confiscating the property and revoking the charter of the Vanderbilt Steamship Co. In June he caused himself to be elected president, and annulled by a decree the existing prohibition of slavery. His arbitrary acts provoked a domestic insurrection, and, after a series of battles, on May 1, 1857, he delivered himself up, with sixteen of his officers, to Commander C. H. Davis of the U. S. sloop of war *St. Mary's*. At New Orleans he was put under bonds to keep the peace, but went back to Nicaragua. In December Commodore Paulding, U. S. N., compelled him and his 132 men to surrender, and carried them to New York; but the Government declined to recognize Walker as a prisoner, on the ground of the illegality of his arrest on foreign soil. In June, 1860, he sailed with a small force from New Orleans to Trujillo, with the design of making a revolution in Honduras. He failed, was captured, and shot.

Walking Leaf.

Walk'ing Leaf, a curious fern found in the N. and middle parts of the U. S. It derives its name from the peculiarity of propagating by touching the ground with the tips of its leaves, where they take root and give origin to new plants.

Walking Stick, any one of several insects, which, with their long bodies and protective coloration, closely resemble the green or dry twigs among which they live. Their motions are slow, the wings small or lacking, and they owe their safety from the attacks of enemies to their mimicry of other objects. One common species, which lives on the oak, is about 3 in. in length, but in the tropics there are species 8 or 10 in. long.

Wall of Chi'na, Great. See China.

Wal'laby (the Australian name), any kangaroo of the genus *Halmaturus*. Wallabies are of moderate size, ranging up to 50 lb.; they mostly "have a bridle mark behind the shoulder and a horizontal stripe across the haunch." They are chiefly nocturnal in their habits. The largest species live in Tasmania; the smallest are found in New S. Wales and in W. Australia.

Wal'lace, Alfred Russel, 1823- ; English naturalist; b. Usk, Monmouthshire; educated at the grammar school of Hertford; devoted himself to natural history; undertook in 1848 an exploration of N. Brazil; explored the Amazon and Negro rivers; obtained vocabularies of Indian tribes, and made collections in ornithology and botany, which were mostly lost at sea; returned to England, 1852; published "Travels on the Amazon and Rio Negro" and "Palm Trees of the Amazon." Spent eight years in exploring the islands of the E. Indies. He arrived, independently of Darwin's researches, at a theory of natural selection, which he embodied in a paper, "On the tendency of Varieties to Depart Indefinitely from the Original Type," read before the Linnæan Society July 1, 1858, simultaneously with Darwin's paper "On the Tendency of Species to form Varieties," etc., being the first public announcement of the so-called Darwinian theory. In

1862 he brought from the E. Indies more than 8,000 birds and more than 100,000 entomological specimens; published "The Malay Archipelago" and "Contributions to the Theory of Natural Selection." Wallace has become noted for his investigations of spiritualism, in which he is a believer, as shown by his "Miracles and Modern Spiritualism." In 1876 he wrote "On the Geographical Distribution of Animals," which has been followed by "Island Life," "Land Nationalization," "Darwinism," and "Australia and New Zealand."

Wallace, Lewis (or **Lew**), 1827-1905; American lawyer, soldier, and author; b. Brookville, Ind.; served as lieutenant in Mexican War, 1846-47; then studied law, which he practiced till April, 1861, when he was appointed adjutant general of Indiana. He served in W. Virginia, where he defeated the Confederates at Romney; brigadier general of volunteers, September 3, 1861; he commanded a division at Fort Donelson, February 16, 1862; in recognition of his services on that occasion was appointed major general of volunteers (March 21st). He saved Cincinnati from capture by Kirby Smith, September, 1862. In 1864, by the desperate battle of Monocacy (July 9th), he prevented the capture of Washington and Baltimore by Gen. Jubal Early. He was a member of the commission which tried the assassins of Lincoln, and president of the commission which tried Capt. Wirz, commandant of Andersonville Prison. In 1866 he went to Mexico on a secret diplomatic mission; was Governor of New Mexico, 1880, and U. S. minister to Turkey, 1881-85. He published "The Fair God"; "Ben-Hur, a Tale of the Christ" (1880); "The Life of General Benjamin Harrison"; "Commodus, a Tragedy"; "The Boyhood of Christ," and "The Prince of India." A larger number of copies of "Ben-Hur" have been circulated than of any other American romance except "Uncle Tom's Cabin."

Wallace, Sir William, 1270-1305; Scotch patriot. He first appears in authentic history in 1297 as leader of a band of insurgents against Edward I. He attacked Scone, whereupon Edward sent into Scotland a force which drove Wallace into Ayrshire. Wallace and Sir Andrew Moray then withdrew to the Highlands, where they organized large forces and captured nearly all the English garrisons in Scotland. A powerful army under the Earl of Surrey was completely defeated at Stirling Bridge, September 11, 1297, and Wallace was recognized in Scotland as guardian of the realm in the name of John Baliol, a prisoner in the Tower of London. In 1298 Edward, with a large force, gained a decisive victory over Wallace at Falkirk. From this time Wallace led a wandering life, heading occasional forays against the English. He took part in the Scottish revolt of 1303; was declared an outlaw, large rewards being offered for his capture; was betrayed by Sir John Mentieth in 1305; taken to London, tried for treason, and hanged, drawn, and quartered.

Wallenstein (văl'ėn-stīn), or **Wald'stein, Albrecht Wenzel Eusebius von,** 1583-1634; Austrian soldier. After traveling through Europe, he served in Hungary against the Turks in the army of the Emperor Rudolf. He inherited a vast estate from his wife and uncle. In 1616 he organized a regiment at his own expense to rescue Gradisca from the Venetians. The emperor now made him a count, and by his marriage he obtained more influence. When the revolution which opened the Thirty Years' War broke out in 1618, he sided with the emperor, saved the imperial treasury from the insurgents, and equipped a new regiment. In 1623 the emperor created him prince, and in 1624 hereditary Duke of Friedland. In 1625 Wallenstein organized an army of 50,000 against the Protestant princes of N. Germany under Christian IV. In 1626 he defeated Count Mansfeld at Dessau and pursued him into Hungary, where this part of the war ended with an advantageous peace. Returning through Silesia, Wallenstein expelled the refractory dukes of Mecklenburg, penetrated into Jutland, and compelled Christian IV to conclude peace. In reward the emperor created him Duke of Mecklenburg in 1629.

The people, however, complained of the burden of supporting his army, and it was seen that he possessed an insatiable ambition and permitted no scruple to stand in his way. In September, 1630, he was dismissed and his army disbanded. He retired to his estates in Bohemia, where he lived, occupied with schemes of the most daring ambition. When Gustavus Adolphus appeared successful in Germany, Wallenstein proposed to join with him against the emperor, but the Swedish King dropped the negotiations.

Meanwhile, after the defeat of Tilly, the situation of the emperor became almost desperate, and the reinstatement of Wallenstein seemed the only means of escape. Wallenstein received the supreme military authority in Germany, and two months later there was a new army ready for battle. In 1632 the Saxons were expelled from Bohemia, and on November 16, 1632, the battle of Lützen took place. Gustavus Adolphus fell, but Wallenstein was defeated. He retreated into Bohemia, and here he remained inactive in spite of the orders of the emperor. He opened negotiations with the Swedes, the Saxon princes, and Richelieu. His plan was by an alliance with these powers to compel the emperor to accept their terms, and the special goal of his personal ambition seems to have been the Bohemian crown. At last his intrigues became known to the emperor, who declared Wallenstein a traitor. In 1634 he fled from Pilsen to seek refuge with the Swedish corps, but two days afterwards he was assassinated at Eger by some of his officers.

Wal'ler, Edmund, 1606-87; English poet; b. Coleshill, Hertfordshire, of an ancient and wealthy family; educated at Eton and King's College, Cambridge; inherited in boyhood an estate of £3,500 a year; chosen to Parliament at nineteen on the accession of Charles I, 1625, and sat in that body much of the time for sixty years; became noted as a writer of elegant and rhythmical verses; after the battle of Edgehill, 1642, was one of the parliamentary commissioners to negotiate with the king at Oxford; was gained over by the Royalists, and entered into a conspiracy, "Waller's plot," for the restoration of royal authority; but the plot having been discovered May 31, 1643, he was imprisoned, fined, and banished, only saving his life by abject humiliation before the House of Commons; spent eight years in France and Italy; was allowed to return about 1653, when he became a favorite with Cromwell. Waller was regarded in the eighteenth century as the first correct versifier, who used the heroic couplet with the smoothness and balance which Dryden and Pope brought to mechanical regularity. He was a general favorite with all parties for his wit and social qualities. His song "Go, Lovely Rose," and the lines "To a Girdle" are among his best works.

Wall'flower, a European half-shrubby plant of the mustard family, often growing on old walls, whence the name. It is a popular garden flower, having blossoms single or double, of varied colors, and of a rich fragrance. The W. wallflower, or "yellow phlox" of the U. S., is a fine plant.

Walloons', the people occupying the tract along the German speech boundary in the S. Netherlands, from Dunkirk to Malmedy, more especially in the Ardennes, parts of the French departments of Pas-de-Calais, Nord, and Aisne, S. Brabant, Hainault, Namur, Liège, Luxemburg, and around Malmedy in Rhenish Prussia. They belong to the great Gallo-Romanic stock —about 2,250,000 in Belgium (*q.v.*)—and are descended from the old Gallic Belgæ (with an admixture of Teutons), who in the forests of the Ardennes resisted the onslaughts of the Germans, mixed themselves with Roman elements, their language becoming Romanized so that it is now a French dialect (patois), containing, however, more Germanic and Gallic elements than any other French dialect. French is the conversational and literary language of the educated Walloons. They have many traits of their own; they are persevering, patient, and industrious, but excitable and passionate; of superior physique, and dark hair and eyes. The Belgian revolution and the separation of Belgium from Holland is preëminently their work. They form the leading element in Belgium, the leading statesmen and men of mark belonging to their nationality. This prestige of the Walloons, with their French sympathies, is opposed by the Flemish population, which belongs to the low German stock. The first permanent colony that settled in New York, and also the first in Brooklyn, consisted largely of Walloons.

Wall Pa'per. See Paper Hangings.

Wal'nut, the common name of trees of the genus *Juglans,* and also of their fruit. In some localities the name is locally extended to the hickories. The English walnut or Madeira nut is the fruit of a stately tree producing excellent timber. The nuts are good eating, and the kernels yield a fixed drying oil prized by artists and makers of varnishes. In the E. U. S. grows the black walnut, which yields a valuable dark-colored timber, used for furniture, joinery, gunstocks, etc. The black walnut produces a strong and very oily nut. The butternut, called also oilnut and white walnut, produces a useful timber. Its nuts are more prized than those of the black walnut.

Nut (1) and Seed (2, 3) of European Walnut.

The Japanese walnut bears its fruit in long clusters.

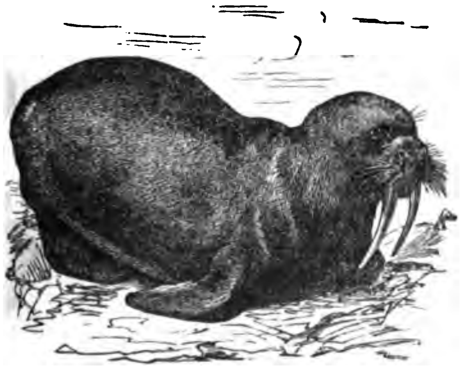
Wal'pole, Horace (fourth Earl of Orford), 1717–97; English author; b. London; educated at Eton and at King's College, Cambridge; traveled on the Continent, 1739–41, accompanied by the poet Gray, with whom he quarreled at Reggio; had a seat in Parliament, 1741–68, but took little part in politics; purchased an estate near Twickenham, 1747; was occupied for years in the erection of a strange, irregular Gothic mansion, which he called Strawberry Hill, and which he filled with a library and museum; set up a private press in 1757, on which, among others, he printed several of his own works; succeeded his nephew as fourth Earl of Orford, 1791, but never took his seat in the House of Lords. He was never married. He compiled "A Catalogue of the Royal and Noble Authors of England," "Anecdotes of Painters in England," "Historic Doubts on the Life and Reign of Richard III," and other works; wrote "The Castle of Otranto," a romance which had great popularity; "The Mysterious Mother," a tragedy; "Memoirs of the Last Ten Years of the Reign of George II," and other works, but will be best remembered by his voluminous and interesting (but unreliable) letters.

Walpole, Sir Robert (Earl of Orford), 1676–1745; English statesman; b. Houghton, Norfolk; educated at Eton and at King's College, Cambridge; elected to Parliament for Castle Rising, 1701, and for King's Lynn, 1702; Secretary of War, 1708, and Treasurer of the Navy, 1709. Failing to prevent the proceedings against Dr. Sacheverell in 1710, he acted with his fellow Whigs, and was one of the managers for the House of Commons at the impeachment. On the overthrow of the ministry he showed great energy in opposition, and incurred the hatred of the majority in the house. He was found guilty of "a high breach of trust and notorious corruption"; was expelled from the house and sent to the Tower, January 17, 1712, the condemnation being due to partisan animosity. He was soon released, and on the accession of George I became successively Privy Councilor, paymaster general of the forces, Chancellor of the Exchequer and First Lord of the Treasury, with the rank of Prime Minister, October 11, 1715; was the determined enemy of the South Sea scheme;

again paymaster general in 1720; returned to power as Prime Minister and First Lord of the Treasury in April, 1721, and was the virtual ruler of England for the ensuing twenty-one years. During his ministry Great Britain was kept free from foreign complications. Peace and sound finance were the chief aims of his administration. There is no doubt that he was not above the lax morality of the time in the matter of bribe giving, but the extent of his personal corruptions was exaggerated. His fall from power was hastened by his peaceful foreign policy, which provoked sharp attacks by Pitt and the Grenvilles, and lost him the favor of the people. He resigned in 1742, after being created Earl of Orford.

Walpurgis (väl-pŏr′gĭs) Night, the evening before May 1st, the vigil of the old festival of St. Walpurgis, who died February 25, 779, and is commemorated on that day in some places, but generally on May 1st. Walpurgis Night is the season of the annual celebration of the "witches' sabbath" on the Brocken in the Hartz Mountains. St. Walpurgis had no connection with this ancient superstition. In fact, the old May-day festival was a heathen one, like that of midsummer (which became the feast of St. John), and the traditions with regard to Walpurgis Night have a dim reference to the old heathen practices. See HALLOWEEN.

Wal′rus, the morse, sea horse, or sea cow; distinguished by having the upper canine teeth developed as large tusks which point downward. There are two species: one inhabiting the N. Atlantic and the other the N. Pacific. The species attain a large size, old males sometimes even exceeding 12 or 13 ft. in length, and their girth is nearly as great; they are inefficient on land, but in water their movements are easy and not ungraceful. They swim entirely under water, rising occasionally to breathe, when they blow somewhat like a whale. The females are smaller than the males, and have much smaller tusks. They feed chiefly upon shellfish—clams, mussels, etc.—but also on the roots of plants which grow in the lagoons and bays. They use their tusks to unearth the clams and drag them from their holes. The walrus was first pursued by the Norwegians along the coast of Finmark, then about the shores of Nova Zembla, finally around Spitzbergen and the adjacent islands, where a few walruses are still found. The fishery is also prosecuted along the coast of Greenland, and far to the northward. Vast herds of walruses are no longer found, and at present the walrus fishery is carried on as a mere adjunct to the whale fishery, and the animals are either taken with harpoons or shot with rifles while on the ice. One or two men, armed with rifles, are landed near a small herd, and it is not uncommon for a skillful hunter to kill from forty to eighty in succession. Walrus blubber makes a good quality of oil, the tusks are used for umbrella handles, and the hides are an article of commerce. The walruses, especially those of the Pacific coast, are threatened with extinction.



THE WALRUS.

Wal′singham, Sir Francis, abt. 1536–90; English statesman; b. Chiselhurst; studied at King's College, Cambridge; traveled on the Continent, and remained there during the reign of Mary; acquired the favor of Cecil, Lord Burleigh, by his political abilities and his knowledge of languages; was sent three times on missions to France, where he resided, 1570–73; was knighted, sworn of the Privy Council, and made one of the principal secretaries of state, 1573; was sent on important embassies to the Netherlands, 1578; to France, 1581, and to Scotland, 1583; was a man of strict morals and undoubted integrity, addicted to religious meditation and to the Puritanic party, but displayed as a statesman a consummate craftiness, bordering on duplicity; was said to have had in his pay in foreign countries many agents and spies, through whom he was informed of the secrets even of hostile courts; was a political adversary, if not a personal enemy, of Mary, Queen of Scots, whom for years he surrounded with spies, who endeavored to inveigle her into real or pretended plots in order to intercept her letters; had in his pay a servant of the French ambassador, Castelnau, and Gray, the envoy of the Duke of Guise to the Scottish court, who was employed in managing the correspondence of Mary and James with their friends in France, thus discovering the so-called "Babington's plot," 1586; was a member of the commission for the trial of the Queen of Scots; was charged by her with having forged the letters produced against her—a charge which he solemnly denied.

Wal′ter, John, 1739–1812; English journalist; b. England; became a printer; bought in 1780 two patents issued to Henry Johnson for logography, or the art of using entire words, their radices, and terminations, instead of single letters, in composing for printing; endeavored to introduce that invention by the establishment of a newspaper, *The London Daily Universal Register*, of which the first number appeared January 18, 1785. Though the system of printing proved a failure, the newspaper prospered, especially after a change of title was made to *The Times* (January 1, 1788), and it gradually rose to the rank of one of the leading periodicals of the world.

Mr. Walter acquired a considerable fortune. His son John (1784–1847) and his grandson John (1818–94) in turn succeeded to the proprietorship of *The Times*.

Wal'tham, city (set off from Watertown and incorporated as a town, 1737; chartered as a city, 1884); Middlesex Co., Mass.; on the Charles River, 10 m. W. of Boston. It is connected by electric railways with Newton and Boston; is compactly built, with two principal streets, a common in the central part, and a fine park, Prospect Hill. There are churches representing the Baptist, Roman Catholic, Universalist, Protestant Episcopal, Methodist Episcopal, Presbyterian, Unitarian, Swedenborgian, and Congregational denominations; public and parochial schools. The Massachusetts School for the Feeble Minded is here. There are two watch-making works—one, the American Waltham, in which the manufacture of watch movements on a large scale by machinery was first attempted, being the largest in the world; a cotton mill, erected in 1814, with bleachery and dyeworks attached, in which cotton cloths were first made in the U. S. from the raw fiber under one roof; and other factories. Pop. (1905) 26,282.

Walther von der Vogelweide (văl'tėr fōn dėr fŏ'gėl-vī-dė), "Walter of the bird meadow," abt. 1170–abt. 1228; German minnesinger. His first patron was Duke Frederick of Austria, after whose death in 1198 he attached himself to several princes in succession, playing a prominent part in art and politics, and he finally received a valuable fief near Würzburg. His earlier songs treated of love, and his later ones of the crusades and the civil commotions in Germany. No man before Luther attacked the pope and the Roman clergy as fearlessly as Walther did. The best and most perfect of his lyric poetry belongs to the last period of his poetic activity.

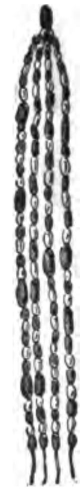
Wal'ton, George, abt. 1740–1804; signer of the Declaration of Independence; b. Virginia; became a lawyer in Georgia; delegate to Congress, 1776–81, and colonel of militia, 1778–79; elected Governor of Georgia in 1779 and 1789; Chief Justice of Georgia, 1783; and U. S. Senator, 1795–96.

Walton, Izaak, 1593–1683; English author; b. Stafford, England; became a linen draper in London, 1624, and acquired a competency, upon which he retired in 1644; sympathized with the royalist cause in the great rebellion, and from that time "lived mostly in the families of eminent clergymen of England, of whom he was much beloved," devoting himself to literature, the contemplation of nature, and the pleasures of fishing. He wrote "Lives" of Dr. John Donne, Sir Henry Wotten, Richard Hooker, George Herbert, and Dr. Robert Sanderson. "The Compleat Angler, or the Contemplative Man's Recreation" (1653) is one of the best-known works of the seventeenth century, perhaps the quaintest treatise of the pleasures of fishing ever penned, and made specially fascinating by charming descriptions of nature.

Waltz, dance of Bohemian origin executed with a rapid, whirling motion, the gentleman having his arm round his partner's waist. The music is written in triple time in crotchets and quavers, and consists of phrases of eight or sixteen bars. Several of these phrases are now usually united to prevent monotony. The *valse à deux temps* is a form of waltz in which two steps are made to each bar of three beats. Classical waltzes are musical compositions in waltz form, not intended for dance tunes. Of this style the composer Chopin is the greatest master.

Wampano'ag, tribe of Indians which lived to the E. of Narragansett Bay, and were almost exterminated in King Philip's War.

Wam'pum (from American Indian, signifying "white"), the strings and belts of beads used as money by some tribes of N. American Indians. The shells of the round clam, or quahaug, were the favorite material. These were drilled lengthwise and strung upon a thread. Wampum was either white or of a black or violet-purple color, the last being valued twice as highly as the first. The wampum belt served not only as money, but as an ornament, and the beads seem to have been used also as counters or aids to memory.



Strings of Wampum.

Wan'dering Jew, the hero of a legend which first appeared in the middle of the thirteenth century in the chronicle of Matthew of Paris, who professes to have received his information from an Armenian bishop, to whom the Wandering Jew himself had communicated the events. According to this version, he was a servant in the house of Pilate, by the name of Cartaphilus, and gave Christ a blow when he was dragged out of the palace to be executed. According to another version—probably of the fifteenth century and of German origin—he was a shoemaker by the name of Ahasuerus, and refused Christ permission to sit down and rest when, on his way to Golgotha, he passed by his house. All versions, however, agree with respect to the verdict of Christ, that he should remain wandering on the earth until the second coming. It was told that he lived for one hundred years, and then, after a great agony, came forth young again. Now and then a man appeared who claimed to be the Wandering Jew. Thus in the sixteenth century Ahasuerus was seen in Hamburg and other German cities, and held long conferences with Dr. Paulus von Eitzen, Bishop of Schleswig. In the beginning of the eighteenth century Cartaphilus appeared in London in the higher circles, and communicated to the most learned professors of Oxford, who came to see him, anecdotes from his personal acquaintance with the apostles, Mohammed, Tamerlane, and others. He has figured largely in works of fiction, as in Eugène Sue's novel "The Wandering Jew."

Wanderoo′. See MONKEY.

Wapiti (wăp′ĭ-tĭ), large deer of the N. U. S. and British provinces. It is generally called elk, but that name belongs by right to the *Alces malchis*, otherwise called moose. The wapiti is closely related to the red deer or stag of Europe, but is a larger and more noble-looking beast, attaining the dimensions of a moderate-sized horse. The color above and about the lower jaw is yellowish brown; the circles around the eyes brown; the rump has a large pale disk extending far above the base of the tail, with a black streak on each side of it; the tail is short; the hoofs are broad and semicircular.

WAPITI.

War, a contest between nations or states (*international war*), or between parties in the same state (*civil war*), carried on by force of arms, usually arising in the first case from disputes about territorial possessions and frontiers, unjust dealings with the subjects of one state by another, questions of race and sentiment, jealousy of military prestige, or mere lust of conquest, rarely nowadays from the whim of a despot; in the second case, from the claims of rival contenders for supreme power in the state, or for the establishment of some important point connected with civil or religious liberty. In all cases the aim of each contending party is to overthrow or weaken the enemy by the defeat or dispersion of the army or navy, the occupation of important parts of his country, such as the capital or principal administrative and commercial centers, or the ruin of his commerce, thus cutting off his sources of recuperation in men, money, and material. International or public war is always understood to be authorized by the monarch or sovereign power of the nations; when it is carried into the territories of a hitherto friendly power it is called an *aggressive* or *offensive* war, and when carried on to resist such aggression it is called *defensive*. Previous to the outbreak of hostilities between states, the power taking the initiatory step issues a *declaration of war*, which now usually takes the form of an explanatory manifesto addressed to neutral governments. During the progress of the struggle certain *laws*, *usages*, or *rights of war* have come to be generally recognized; such laws permitting the destruction or capture of armed enemies, the destruction of property likely to be serviceable to them, the stoppage of all their channels of traffic, and the appropriation of everything in an enemy's country necessary for the support and subsistence of the invading army. On the other hand, though an enemy may be starved into surrender, wounding, except in battle, mutilation, and all cruel and wanton devastation are contrary to the usages of war, as are also bombarding an unprotected town, the use of poison in any way, and torture to extort information from an enemy; and generally the tendency in all laws and usages of war is becoming gradually more favorable to the cause of humanity at large.

War′beck, Perkin, a pretender to the throne of England in the reign of Henry VII, hanged at Tyburn, November 23, 1499. He appeared at the court of Margaret, Dowager Duchess of Burgundy, in 1490, impressed everyone with his resemblance to Edward IV, and was taught to represent Richard, Duke of York, younger brother of Edward V, supposed to have been murdered by Richard III. He had many partisans in England and Ireland, and was aided by Charles VIII of France. He was twice driven from English territory, which with 600 men he had invaded in 1495, and went to Scotland, where he was acknowledged by James IV. Going soon after to Bodmin, Cornwall, he was joined by 7,000 of the inhabitants and began the siege of Exeter, calling himself for the first time Richard IV, King of England, September 7, 1497. But he was forced to retire to Taunton, was captured, and confined in the Tower. Being detected in a plot for escaping, he was tried and executed.

War′bler, a family of small birds related to the thrushes. Why the popular name was given it is hard to say, as very few of the warblers sing. The American warblers include over 120 species, all of small size, under 6 in. in length, and many have bright but not gaudy plumage. They are active, largely insectivorous in diet, and vary greatly in their nesting habits, some making simple nests, others structures which rival those of humming birds in beauty. The Old World warblers include about 150 species, generally of subdued colors.

Ward, Artemas, 1727–1800; American soldier and jurist; b. Shrewsbury, Mass.; graduated at Harvard, 1748; served in the French and Indian War, becoming lieutenant colonel. On June 17, 1775, Congress appointed him first major general, and he was in command of the army which began the siege of Boston. He was afterwards made second in command under Washington, and resigned in April, 1776, in consequence of ill health; member of Congress, 1791–95.

Ward, Artemus. See BROWNE, CHARLES FARRAR.

Ward. See GUARDIAN.

War Depart'ment, in the U. S., an executive department of the Government, having control of military affairs; under the supervision of the President, as commander in chief of the army, and under the direction of the Secretary of War, an officer of the Cabinet appointed by the President by and with the advice and consent of the Senate. The secretary supervises estimates of appropriations for the expenses of the department and of the administration of the military service, the control of the Board of Ordnance and Fortification, the supervision of the U. S. Military Academy at West Point, and the direction of river and harbor improvements. The administration of our island possessions also comes under this department. The department is subdivided into military bureaus, each under the direction of an officer of the regular army. These officers are the adjutant, inspector, quartermaster, commissary, surgeon, and paymaster generals, the chief of engineers, the chief of ordnance, the judge-advocate general, and the chief signal officer.

Ware'housing Sys'tem, a credit system, whereby the government extends the time for the payment of duties and revenue upon goods, retaining them in its possession meanwhile to secure such payment. Duties on imports or on manufactures naturally fall due as soon as the goods arrive or are produced. But the economy and convenience of importing and making articles in great quantities and in advance of their actual requirement is so great, and the immediate payment of duties upon them would often involve such a large investment of capital, that the principle of warehousing goods in government custody, with a reasonable extension of time for the payment of the duties has been adopted by all the leading commercial nations. The payment of the duties is secured by a bond. The goods are then said to be "in bond," the period allowed for the payment of the duties, etc., is the "bonded period," and places of deposit are known as "bonded warehouses" or "bonded stores." The importer or owner has access to the goods at any time during the bonded period, and he thus practically pays the duties when he sells the goods.

Warm'ing and Ventila'tion. By ventilation is meant a regular and continuous change of air in a room or inclosed space. The objects of ventilation are to remove offensive or dangerous gases, foul odors, dusts, and moisture, to supply oxygen, and to regulate temperature. It is a very common idea that ventilation means simply the removal of foul air, and that if an opening is provided for this purpose all that is necessary has been done. But it is the securing of the admission and proper distribution of a sufficient quantity of fresh air that is the real problem, and if this be done the getting rid of the foul air is comparatively easy.

The amount of air supply to be provided for a room depends on the purposes for which it is to be used—whether it is to be occupied for hours continuously, like a sleeping room or hospital ward, or only for an hour or two. Assuming that no reliance is to be placed on cracks and crevices, and that walls will be made practically air tight by paper or paint, the following table shows the amount of air which should be supplied to different kinds of rooms to secure freedom from odor and satisfactory ventilation:

CHARACTER OF ROOMS	Cubic ft. of air an hour.
Hospitals	3,600 per bed.
Legislative assembly halls	3,600 per seat.
Barracks and bedrooms	3,000 per person
Schools and churches	2,000 to 2,400 per person.
Theaters and ordinary halls of audience	2,000 per seat.
Office rooms and dining rooms	1,800 per person.

As a rule, the amount of air required for diluting the products of respiration is also sufficient to maintain combustion of fires and lights; but if the number of lights be large in proportion to the number of persons, a special supply of air for them may be desirable; 1,000 cu. ft. of air per hour per gas burner is sufficient. Electric lights require no provision for air supply.

While natural ventilation is still relied upon for almost all dwelling houses, engineers are resorting more and more to artificial ventilation by the use of some form of fan or blower in large buildings where many persons are assembled. Such fans or blowers are often so placed as to force a current of air through a series of coils of steam-heated pipes, and thence through galvanized-iron ducts to the rooms which are to be warmed, forming what is known as a hot-blast system. Such fans are usually comparatively small, are run at high speed, and the ducts are small, thus necessitating considerable velocity in the currents passing through them to furnish the requisite supply. When the air is forced into a room by means of a fan or blower it is called a plenum system, and this is what is usually employed for halls of assembly. When the air is drawn from the room by a fan or heated chimney, it is called an aspirating system. Sometimes both systems are employed together. As electricity has become more available as a source of power, the use of small electric aspirating fans is increasing, and they may often be made useful; but to effect a really useful change of air they must have some opening for discharge of air outside the room.

The artificial heating of a room or building is effected in several different ways, technically known as direct radiation, indirect radiation, and direct-indirect radiation, or by combinations of these. In heating by direct radiation the heating surfaces are placed in the room to be warmed, and are not connected with the air supply. This includes fireplaces, ordinary stoves, pipes, or radiators heated by steam, hot water, or electricity, and methods of heating the walls and floors of a room as a mass. Of these, the fireplace, or open grate, is the only one which really heats entirely or mainly by radiant heat, in which the heat passes in straight lines through the air until it is intercepted by some solid or liquid, which it warms. Such heat does not appreciably warm the air through which it passes. Much the greater part of heat furnished by stoves and heated pipes or other surfaces is convected heat—that is, heat conveyed by particles of air which come in contact with the hot surface and then pass off in currents, conveying this heat to the colder surfaces in the room against which they strike. Heating by indirect radiation is the heating by hot air, which air has been warmed by heating surfaces placed in some other room, usually in the basement or cellar, and which are heated either directly, as in a furnace, or by steam or hot water. In heating by direct-indirect radiation the heating surfaces are placed in the room to be warmed, but are so arranged, usually against the outer wall or beneath the windows, that fresh cold air is brought in around them in order that it may be warmed.

Direct-radiation heating by means of fireplaces is the cheapest as regards construction, but much the most costly as regards fuel. Direct-radiation heating by means of steam is now more used in large buildings than any other, because the apparatus is cheaper to construct than that for steam or hot-water indirect radiation, and can also be run with less cost if there is little or no fresh air to be heated.

The great majority of small dwelling houses in the U. S. are heated by stoves, and have no provisions for ventilation. In houses of a somewhat better class the hot-air furnace is very commonly employed, and of this there are many patterns. As furnaces are usually set, the only way to prevent the room from becoming too warm is to shut off the air supply of the room. The source of the fresh-air supply to a furnace is often unsatisfactory, and is contaminated with cellar air. So far as comfort and health are concerned, the best mode of heating is by indirect radiation from surfaces heated by water to a temperature not to exceed 180° F., and usually not exceeding 150°. The object of this method is to warm all the air required for heating and ventilation to the temperature desired, and no more. In steam heating with ordinary forms of radiators the temperature of the radiators must be about 210° F., while steam is circulating, hence the air must be heated more than is desirable, and the requisite temperature obtained by mixture with cooler air. As a hot-water apparatus must have a greater amount of radiating surface and larger flow and return pipes than one for steam, it is more expensive, the extra cost being from 25 to 35 per cent.; but, on the other hand, it uses less fuel and requires less skilled management.

War'ner, Charles Dudley, 1829–1900; American author; b. Plainfield, Mass.; graduated Hamilton College, 1851; was admitted to the bar in Philadelphia, 1856; practiced in Chicago until 1860, when he became assistant editor, and in 1861 editor, of the Hartford *Press*. He traveled much, and published several volumes of travel, humorous sketches, essays, novels, and other writings, including "My Summer in a Garden," "Saunterings," "Back-log Studies," "The Gilded Age" (with S. L. Clemens), "Mummies and Moslems," "In the Levant," "In the Wilderness," "Their Pilgrimage," "On Horseback," "A Little Journey in the World," and "The Golden House"; was for years one of the editors of *Harper's Magazine*.

War of 1812, The, war between the U. S. and Great Britain which resulted from British claims to the right to search American vessels and seize alleged British subjects therefrom for service as seamen in the navy. June 1, 1812, Pres. Madison sent to Congress a message recounting British aggressions. On the 18th Congress declared war.

The U. S. at the outbreak of the war had a population of about 8,000,000. Great Britain and Ireland had a population of nearly 20,000,000, and had for a long time been expending blood and treasure lavishly in the mortal conflict with Napoleon. There was not a universal sentiment in the U. S. that war was necessary. The North and East were the sections which had suffered the most from the depredations inflicted by England on American commerce, yet many of the people of New England preferred to bear the ills they had rather than to fly to the heavier if more honorable losses of war. If the choice must be made, they preferred a war with France, in order that England might be an ally, and not an enemy, and that her fleet might not harry their coast and destroy their commerce. But if they must fight against the mistress of the seas, they desired that the navy be strengthened and given every help. Because of these different opinions, the country was weaker than it would have been, and suffered disasters that might have been avoided, had there been a common front against a common enemy.

The war was fought along the lakes, along the N. Atlantic shore, and along the Gulf of Mexico. It opened in the N. by the invasion of Canada from Detroit by Gen. Hull, Governor of the Territory of Michigan. In about a month Hull had surrendered his entire force without fighting, and Michigan and parts of Ohio were overrun by the British, whose progress was withstood by Gen. William Henry Harrison, who in the preceding year had earned distinction by defeating the Shawnees under their chief, Tecumseh, and his brother, "the Prophet." The campaign of 1813 gained little credit to the American arms. Gen. Jacob Brown successfully defended Sackett's Harbor, and Harrison routed the British and their savage allies on the Thames, killing Tecumseh; but other attempts at invasion by Wilkinson and Hampton resulted in disgraceful retreats, while the British overran W. New York and burned several towns in retaliation for the burning of Toronto (then York). In September, Lieut. Oliver H. Perry, of the U. S. navy, in command of an extemporized fleet, defeated and captured the British squadron, giving the Americans complete control of Lake Erie. The campaign of 1814 witnessed a marked change. On the one hand, the British forces in Canada were heavily reënforced by veteran troops from Europe; on the other, the American soldiery were acquiring discipline, and able young commanders were coming to the front. Under Jacob Brown and Winfield Scott the Americans won the victories of Chippewa and Bridgewater (or Lundy's Lane). On the other end of the Canada line the invasion of a powerful army under Sir George Prevost was defeated through the destruction, off Plattsburg, of the supporting squadron by an American fleet under McDonough. This practically closed the war on the N. frontier.

On the Atlantic coast the years 1812 and 1813 were marked by the gallant efforts of the six or eight U. S. frigates and as many sloops of war to sustain themselves against the numerous cruisers and, later, the powerful fleets of Great Britain. In spite of victories in single combat which reflected the highest credit on American seamanship and courage, the few armed vessels of the U. S. were one by one captured by superior force or blocked up in the N. harbors, and in 1814 the British fleets cruised without serious opposition along the whole coast, depredating and destroying at will, though American privateers still swarmed over the seas, inflicting great damage upon British commerce. In August, 1814, a British army under Gen. Ross, supported by a powerful fleet under Admirals Cockburn and Cochrane, captured Washington after an insignificant conflict at Bladensburg, and burned the Capitol and the President's mansion. In September the same force attacked Baltimore, but both the army and the fleet were beaten off, Gen. Ross being killed at North Point.

The third theater of war was at the Southwest. The Creeks of Alabama having taken up arms, Gen. Andrew Jackson, with a body of W. levies, invaded their country and defeated them with great slaughter at Tohopeka in March, 1814, compelling the cession of the larger part of the Creek lands. In the summer of the same year a British party occupied Pensacola, then claimed by the Spaniards, and later assaulted, unsuccessfully, Fort Bowyer, near Mobile. In December the British advanced to a formidable attack on New Orleans, and Jackson prepared for its defense. A night attack was made (December 23d) on the British camp, for which considerable effect has been claimed; but on January 8, 1815, the British commander, Pakenham, advanced with a greatly superior force of Wellington's veterans against the U. S. lines, and was repulsed, he himself, his second in command, and 2,600 men falling in the attack, while the U. S. loss was less than 100. Never had a British army been so disastrously beaten. Meanwhile peace had already been concluded at Ghent, December 24, 1814. By the articles of the treaty all conquests on both sides were to be restored, while the questions of search and impressment, concerning which the war had been begun, were not mentioned.

War of Succes'sion. See SUCCESSION WARS.

War'rant, any one of various writs by which a person or court legally directs a person or officer to do some act; specifically, an order or writ or process, under seal, issued by some court or justice or officer authorizing and directing the person to whom it is addressed to arrest some person named therein and bring him before a court, judge, or magistrate for examination, trial, or sentence, or otherwise legally dispose of him, or to take certain goods named, or to search for the person or property named and take the same. A warrant issued by a court is called a bench warrant, and such warrants are generally used for the purpose of apprehending a criminal who is at large either on bail or otherwise for an examination, indictment, or trial, or when he has committed an offense in the presence of the court. A warrant to discharge from prison a person who has been bailed is called a warrant of deliverance. A warrant authorizing a levy of a penalty by distress and sale of goods is called a warrant of distress. A search warrant authorizes an officer to search certain private premises to find articles specified in the warrant. There are various other species of warrants.

War'ranty, in law, a name given to a class of agreements which are always based upon and collateral to some other and principal contracts. There are three distinct species in common use. A warranty on the sale of land is an express covenant contained in a deed of conveyance, whereby the grantor binds himself and his representatives to warrant and defend the grantee, his heirs and assigns, in the quiet and peaceable possession of the land conveyed against anyone claiming the same by a title paramount to that of the grantor. Another form protects the grantee against persons only claiming under the grantor himself.

Warranty on the sale of chattels is an agreement respecting the goods, subsidiary and collateral to the sale contract, the breach of which does not give the other party the right to treat the contract as repudiated, but only the right to damages.

Warranties are either express or implied. The word warrant is not necessary to an express warranty, nor is actual intention to warrant on the part of the seller essential. If the language employed contains an assertion, as distinguished from a mere opinion, that the subject of the sale has certain qualities or will answer certain requirements, and the assertion is relied upon by the buyer in making the purchase, there is an express warranty. An example of an implied warranty is found in a sale by sample—that the goods shall be free from any defect rendering them unmerchantable which is not apparent on a reasonable examination of the sample.

Warranties in policies of insurance are stipulations by the assured which constitute the conditions upon which the policy is issued. See INSURANCE; GUARANTY.

War'ren, Gouverneur Kemble, 1830–82; American soldier; b. at Cold Spring, N. Y.; graduated at the U. S. Military Academy, 1850, and entered the engineers; Asst. Prof. of Mathematics at West Point, 1859–61; promoted brigadier general of volunteers, 1862; became chief topographical engineer under Hooker, 1863, and the following year chief engineer of the Army of the Potomac; rendered gallant and meritorious services as major general of volunteers until the close of the battle of Five Forks, 1865, when he was deprived of his command by Sheridan, owing to a misunderstanding; placed in command of other troops and promoted lieutenant colonel of engineers, 1879.

Warren, Joseph, 1741–1775; American patriot; b. Roxbury, Mass.; graduated at Harvard, 1759; studied medicine under Dr. Lloyd; began practice at Boston, 1762; delivered in 1772 and in 1775 the civic oration on the anniversary of the "Boston Massacre"; member of the Provincial Committee of Correspondence, 1772; chairman of the Committee of Public Safety, 1774; and in 1775 president of the Provincial Congress, with broad powers, being thus the virtual executive at the outbreak of hostilities with Great Britain; organized the volunteers after the battle of Lexington; chosen major general by the Provincial Congress, June 14th; declined the command at the battle of Bunker Hill, at which he was killed, falling near the spot where the Bunker Hill Monument now stands. It was Warren who sent Paul Revere on his ride to Lexington.

Warren, Samuel, 1807–77; Welsh lawyer and author; b. Racre, Denbighshire; educated at the Univ. of Edinburgh; began the study of medicine, but soon abandoned it for law; contributed to *Blackwood's Magazine* when he was only seventeen years of age, and afterwards his well-known "Passages from the Diary of a Late Physician," 1830–31; wrote several legal works; became queen's counsel, 1851; was Recorder of Hull, 1854–74; sat in Parliament as a Conservative, 1856–59, and was appointed Master in Lunacy, 1859; published "Ten Thousand a Year," 1839, and the pamphlet, "The Queen and the Pope," 1850, a violent attack on the pretensions of the Roman Church.

War'saw, capital of the Russian general government of the Vistula provinces, formerly the capital of the Kingdom of Poland; on the Vistula. It stands on a hill which gradually descends into a flat plain, and consists of the old town, the new town, and suburbs, of which the most important is Praga, on the right bank of the river, connected with Warsaw by two iron bridges. The location of Warsaw is of great commercial importance. The navigable Vistula, the highroads in all directions, the railways to Moscow, to St. Petersburg, to Vienna, to Dantzic, to Berlin by way of Lodz, the Warsaw-Terespol, and the Vistula Railway, make the city a commercial center for the European-Asiatic traffic. Industries flourish. Linen and woolen cloths, carpets, boots, leather goods, cotton and silk fabrics, pianos, carriages, furniture, gold and silverware, machinery, chemicals, sugar, and tobacco are made, and there are large distilleries and breweries. There is much export trade in grain, flax, cattle, and horses, and in coal, while the finer goods are imported. Weekly markets and annual fairs attract thousands of tradesmen.

In architectural respects Warsaw has been greatly improved; formerly wretched and dirty huts alternated with magnificent palaces. Some portions of the city, like the Cracow suburb, are very beautiful, and are not surpassed by those of any other European city. Warsaw has twelve public squares, full of historical monuments; among them are the Saxon Square, the Krasinski Square, and the Sigismund Square, with the column of Sigismund III, erected in 1643. Among the public buildings that show the fondness of the old nobility for display is the royal palace, built by Sigismund II, embellished by Augustus II and Stanislaus Augustus, with its unique library and the Polish archives. A beautiful park adjoins St. John's Cathedral, built in 1360, which contains fine pictures and many tombs of celebrated Poles, and which is the most remarkable of the 179 Catholic churches. The Belvedere, the residence of Grand Duke Constantine till the outbreak of the great insurrection, the city hall, the mint, and the theaters are beautiful edifices. The Greek Catholic Cathedral, completed in 1842, is in the modern style; the Lutheran Church is one of the finest buildings in the city. Among the many scientific institutions is the university, founded in 1817, suppressed in 1832, and reëstablished in 1869.

Warsaw was in existence in 1224, and in 1339 it was strongly fortified. It was the residence of the dukes of Masovia till their extinction in 1526. Sigismund Augustus made it the residence of the Polish kings instead of Cracow. The Swedes under Charles X Gustavus conquered the city in 1655, lost it 1656, but reconquered it after the murderous three days' battle at Warsaw (July 28–30, 1656). By the third partition it fell to Prussia, and by the Vienna Congress in 1815 it became definitely Russian. After the insurrection of 1830 it was stormed and crushed by Paskevitch, and again in 1863 a revolution was suppressed. Still the vitality of the city and the nation was such as to recover and to increase even in spite of the most unfavorable political conditions. Warsaw is the center of the Polish nation, full of national spirit, learning, and culture. Pop. (1901) 756,426, more than fifty per cent Roman Catholics, thirty-three per cent Jews.

Wars of Succes'sion. See SUCCESSION WARS.

Wartburg (värt'bŏrch), a picturesquely situated castle in the NW. of the Thuringian forest, near Eisenach, Saxe-Weimar, founded abt. 1070 by Louis, landgrave of Thuringia, and the residence of his successors nearly four hundred years. The castle is famous for a musical tournament of minnesingers in 1206 or 1207, for its connection with the story of St. Elizabeth of Hungary, and for the concealment of Luther in it in 1521–22. The celebration by German students of the third centenary of the Reformation, October 18, 1817, is known as the Wartburg festival.

WARTHOG.

Wart'hog, two species of family *Phacochœridæ.* The popular name given to wild hogs of

Africa on account of the large, fleshy projections on all sides of the face. The body is stoutly built, legs small, head very large, with a small but prominent eye set far up and back on the head. The snout is large, upper teeth or tusks curved upward and outward, and sometimes of enormous size. They live on roots, which they pull up with their tusks.

Warts, or Ver'rucæ, small excrescence or elevation on the skin, developed by abnormal growth of the papillæ of the skin. They may be round or conical, threadlike, or broad and flat. The so-called "seeds" or points of a dry wart correspond to the number of papillæ which have become thickened. Each papilla of the skin has an independent supply of blood by a little loop of blood vessels at its base. Hence mere removal of the wart is followed by its renewal from the well-nourished base and remaining cells which have transmitted the tendency to excessive growth. Cases are cited of warts communicated by the blood from other warts, but the best authorities deny them. Warts occur chiefly in children between the second and fourteenth year; their cause is uncertain. Their duration is indefinite; they sometimes disappear suddenly, probably by contraction of the vessels at the base and casting off of the dry cells. When they are kept free from handling or irritation, the diet is corrected, and alteratives are given, they may slowly disappear. The common treatment is to snip them off and touch the base with nitric acid or lunar caustic.

War'wick, Richard Neville (Earl of), surnamed "the KING MAKER," abt. 1420–71; eldest son of Richard Neville, Earl of Salisbury, and cousin of Edward IV. He had the credit of the victory of the Yorkists at St. Albans, May 22, 1455, and was made Governor of Calais. He crossed over to England in June, 1460; drove the imbecile king, Henry VI, from London, and captured him at Northampton (July 10th). In 1461 Henry was set at liberty by Queen Margaret's victory at St. Albans, but Edward of York effected a junction with Warwick's forces, and was proclaimed king in London as Edward IV. In June, 1465, Henry was betrayed, and Warwick conducted him to the Tower. Edward had married, in 1464, Elizabeth Woodville, the widow of Sir John Grey, and the Woodvilles soon supplanted the Nevilles in the confidence of the king, who was displeased by the secret marriage in 1469 of his brother Clarence to Warwick's daughter Isabella.

The Nevilles seized the opportunity of an insurrection to overthrow their rivals. Warwick and Clarence defeated part of the royal forces at the battle of Edgecote, July 26, 1469, captured and beheaded the father and brother of the queen, and led Edward prisoner to Middleham. Soon afterwards Edward, released from prison, reappeared in London, pardoned Warwick and Clarence, and restored them to his confidence. In 1470 Warwick and Clarence instigated a movement to place the crown on Clarence's head, but were forced to flee to France. They returned in 1470, proclaimed Henry VI king, and marched upon the capital. Edward fled to Holland; Henry was taken from the Tower, and the Nevilles were reinstated in their offices and honors. In 1471 Edward returned, and entered London without resistance. Three days afterwards he attacked Warwick at Barnet, April 14th, and the latter was defeated and slain.

Warwick, town of Kent Co., R. I., settled in 1642 by twelve Englishmen, and incorporated, 1647. It is 5 m. S. of Providence, on the Providence and Pawtuxet rivers. It has no compactly settled quarter, and consists of about twenty-seven villages. The Pawtuxet furnishes power for many establishments, chiefly cotton (some woolen) and printed goods. Pop. (1906) 25,464.

Wash'burne, Elihu Benjamin, 1816–87; American statesman; b. Livermore, Me.; learned the printer's trade; afterwards studied law; in 1840 settled in Galena, Ill., where he began the practice of law; in 1852 was elected to Congress, and continued to serve till March, 1869. At the time of his retirement he was by consecutive elections the oldest member, or "the father of the house." On the accession of Gen. Grant to the presidency he was appointed Secretary of State, but soon resigned to accept that of minister plenipotentiary to France. He was serving in this capacity at the outbreak of the war between France and Prussia, and was the only foreign minister to remain at his post during the siege of Paris and the Commune, giving shelter and protection to foreigners. His firmness in protecting the Germans who were unable to leave Paris won admiration. He was the author of "Recollections of a Minister to France."

Wash'ington, Booker Taliaferro, 1857 or 1858– ; American educator; b. Hales Ford, Va.; educated Hampton Normal and Agricultural Institute, Va.; A. M., Harvard, 1896; principal Tuskegee Normal and Industrial Institute since 1881; author of "Black-Belt Diamonds," and magazine and newspaper articles. He has aided the colored race by emphasizing the fact that the solution of the negro problem in the U. S. is not to be attained so much by the negro's assertion of his political rights as along the lines of intellectual and industrial improvement.

Washington, George, February 22, 1732–December 14, 1799; first President of the U. S.; b. Westmoreland Co., Va.; son of Augustine Washington and his second wife, Mary Ball. He received only the education of the schools of the neighborhood. After leaving school, he passed his time at Mount Vernon, the estate of his elder brother Lawrence, where he studied surveying. He made surveying his profession, and was employed by Lord Fairfax.

By the will of his brother Lawrence, who died in 1752, and whom he had accompanied to the Barbadoes for his health in 1751, the estate of Mount Vernon was, on the demise of an infant daughter, given to George, who added to it by later purchases. In the meantime the prospect of a collision on the frontier increased, and the province was divided into four districts, of which the N. was assigned to Washington as adjutant general.

In 1755 two regiments of royal troops were sent out under Braddock, which were joined by the provincials of Virginia. On the day of Braddock's defeat, July 9, 1755, Washington was almost the only officer of distinction who escaped with life and honor. The duty of protecting the frontier now devolved upon him till the end of the war. In 1758 he commanded the Virginia contingent in the abortive campaign under Gen. Forbes against Fort Duquesne. On January 17, 1759, he married Martha Dandridge, the wealthy widow of Daniel Parke Custis, and soon afterwards removed to Mount Vernon.

Washington was a member of the House of Burgesses during the whole period of that war of legislation in England, and popular resistance and agitation in the colonies, which preceded the appeal to arms; and in 1774 he was a delegate to the Continental Congress. On April 19, 1775, the conflict opened at Lexington and Concord; and the Continental Congress on June 15th unanimously elected Washington commander in chief of the armies of the Revolution. He took command of the forces besieging Boston on July 3d; and the British evacuated that town on March 17, 1776. Then followed, in rapid succession, the disasters of Long Island, of Fort Washington, and of the calamitous retreat through the Jerseys. The brilliant stroke at Trenton and the substantial success of Princeton restored the drooping courage of the people; but they were followed by the reverse at Brandywine, the unsuccessful blow at Germantown, and the terrible winter at Valley Forge. The greatness of Washington never appeared at better advantage than in the period that followed.

During the summer of 1778 the courage and skill of Washington turned a disgraceful commencement of the day at Monmouth into a substantial victory; but from that time forward no brilliant success attended the forces under his immediate command till the final blow was struck, with the overwhelming numbers of the combined American and French forces, at Yorktown. After this great success the war still dragged out a lingering existence. More than two years elapsed from the capitulation of Yorktown (October, 1781) to the evacuation of New York (November 25, 1783). On December 23, 1783, Washington resigned his commission as commander in chief of the army to the Continental Congress sitting at Annapolis. He retired to Mount Vernon, and resumed his occupation as a farmer and planter, shunning all connection with public life. He was a member of the convention at Philadelphia in May, 1787, to frame the Constitution of the U. S., and was unanimously elected its President.

The Constitution was far from being warmly or generally welcomed; and it is doubtful whether it would have been ratified but for the popularity of Washington, who was instinctively marked out by public expectation as the first President. He was chosen by the unanimous vote of the electoral colleges. John Adams was Vice President. He was inaugurated in New York, April 6, 1789, public apathy having prevented the assembling of a quorum of Congress till long after the appointed time, March 4th. His cabinet consisted of Thomas Jefferson (Secretary of State), Alexander Hamilton (Treasury), and Gen. Knox (War). Foreign affairs were in an unsatisfactory condition. General apathy, distrust, and uneasy expectation reigned at home. Out of this chaos order was speedily educed by the administration, in spite of the rivalry between Jefferson and Hamilton. In the autumn of 1792 he was unanimously reëlected, and Adams was reëlected Vice President. The great rivals in the cabinet gave place to men of inferior ability, but pursuing the same line of policy as their predecessors.

At the close of his term, March 4, 1797, Washington retired to Mount Vernon. On December 12th, while taking his usual ride around his farms, in a storm, he caught a severe cold, and died two days afterwards of acute laryngitis, a disease then almost unknown. Washington was 6 ft. 2. in. high; his person in youth was spare but well proportioned, and never too stout for prompt and easy movement. His hair was brown, his eyes blue and far apart, his hands large, his arms uncommonly strong, and the muscular development of his frame perfect. He was childless, but most happy in his domestic relations, and adopted two grandchildren of his wife. In the resolutions adopted by Congress at his death, moved by John Marshall, occurs the expression, "First in war, first in peace, and first in the hearts of his countrymen," attributed to his old friend, "Light-horse Harry" Lee.

Washington, one of the U. S. of N. America; the twenty-ninth in order of admission into the Union; popularly known as the "EVERGREEN STATE; capital, Olympia; is bounded N. and NW. by British Columbia, E. by Idaho, S. by Oregon, and W. by the Pacific. The S. boundary for three fourths of its length follows the Columbia River, the E. part of it following the parallel of 46°; and the S. part (about 30 m.) of the boundary between Washington and Idaho is formed by the Snake River; extreme width, N. to S., about 240 m.; length, E. to W., 360 m.; area, 66,880 sq. m.; pop. (1910) est. at 1,250,000.

The Cascade Mountain Range, extending N. to S., divides the state into E. Washington and W. Washington. E. Washington includes an area sometimes called central Washington, lying between the Columbia River and the Cascade Mountains, and including the Yakima and Kittitas valleys, formerly considered sterile sage-brush plains, but now being transformed into fertile valleys by irrigation from the Yakima, a tributary of the Columbia. These two rivers, with the Snake, Spokane, Methow, and Okanogan rivers, are the most important water courses of E. Washington. They afford immense possibilities of water power, as there are many falls and rapids. The falls at Spokane are already utilized. The largest lake in the NW. is Lake Chelan, Okanogan Co., E. Washington, 70 m. long and about 3 m. wide. Besides the two valleys mentioned there are the fertile valley of Walla

Walla, the Palouse valley, the Colville valley, the Okanogan valley (now used for grazing), and the large plateau known as the Big Bend country. W. Washington is entirely different in its general features. Its area is a little over one half as great, and its slope to tidewater is abrupt when compared with the long stretch of rolling plains and valleys of E. Washington. The most important part of W. Washington is known as the Puget Sound Basin. Its great body of water, now known generally as Puget Sound, embraces about 2,000 sq. m., including one of the finest series of harbors on the globe. The rest of the coast is abrupt and barren of harbors, excepting Gray's and Willapa harbors. The important rivers of the Puget Sound Basin are the Skagit, Snohomish, Puyallup, Nisqually, White, and Dwamish—all of which drain productive and fertile valleys bearing the names of the rivers. Other important rivers of W. Washington are the Chehalis, flowing into Gray's harbor; the Willapa, flowing into Willapa harbor; and the Cowlitz, flowing S. into the Columbia River. A branch of the Snohomish forms the picturesque Snoqualmie Falls, 20 m. E. of Seattle. The most important lake in W. Washington is Lake Washington, about 15 m. long and 3 m. wide. Lake Union lies between this lake and Puget Sound, and Seattle extends to the shores of both lakes. Lake Whatcom lies back of New Whatcom. Along the W. coast is a range of irregular mountains called the Olympics, or Coast Range.

THE SEAL OF THE STATE OF
1889
WASHINGTON

Two whole counties—Island and San Juan—are composed entirely of islands. They are important for agriculture, and supply the bulk of the lime used in the state. The possession of most of these islands was a matter of dispute with Great Britain for years, and was not adjusted until 1873. The names of the most important islands are Whidby, San Juan, Orcas, Lopez, Camano, Fidalgo, Guemes, Lummi, and Waldron. The highest points in the state are: Mount Rainier, 14,444 ft.; Mount Baker, 10,827; Mount St. Helens, 9,750 ft.; and Mount Adams, 9,570 ft.

The native animals include the elk, deer, caribou, mountain goat, mountain sheep (bighorn), bear, cougar, wildcat, wolf, coyote, raccoon, otter, beaver, wolverine, martin, skunk, muskrat, fisher, and small rabbits and squirrels. There are no poisonous reptiles or insects, except a few rattlesnakes found in E. Washington. The birds are innumerable. The principal game birds are ducks, geese, swans, prairie chickens, grouse, pheasants, quails, and pigeons. Fossil remains of many extinct animals and fishes are found. The streams and lakes abound in many varieties of fish and shellfish. The principal fishes of commerce are the salmon and halibut. Native oysters, though small, are largely exported to Pacific coast markets.

The director of the U. S. weather service says: "For equability and mildness of climate, absence of either very hot or very cold waves, and freedom from destructive tornadoes or cyclones, Washington stands foremost among the favored states of the American Union." The mean annual rainfall over the immediate Pacific coast portion of the state ranges from 79 to 107 in. This immense rainfall occurs during the three winter months, and during the rest of the year the rainfall is not excessive. The government records are dispelling the erroneous idea that Washington has an excessively rainy climate. The prevailing soil in E. Washington is a volcanic ash. It is light, and, when properly watered, wonderfully productive. In W. Washington the soil mostly cultivated is that of the river bottoms and reclaimed tide marshes, where it is a rich alluvial loam. The first settlers found in E. Washington the bunch-grass plains, unexcelled for natural grazing ground, and in W. Washington the unparalleled forests of cone-bearing trees. The reclaimed tide marshes of the Puget Sound Basin are very productive. The state, especially the W. portion, was heavily clothed with vegetation. The forests are famous for the size and number of trees. A large percentage of these belong to the cone-bearing family, and the deciduous or hardwood varieties are few and of little value. About nine tenths of the Puget Sound forests consist of fir. The other trees are cedar, spruce, hemlock, larch, pine, maple, alder, cottonwood, dogwood, crab apple, yew, and a few oaks. The total timber area of the state is put at 34,000 sq. m. Smaller vegetation grows in luxuriant tangles in the lowlands of W. Washington, and in some places is practically impenetrable. The soil in such localities, when cleared, is the richest. In E. Washington there are some forests of pine, fir, and cedar, prized by the settlers, but the timber is much inferior to that of the Puget Sound forests. The drier plains of E. Washington were originally covered with sage brush and bunch grass.

The principal crops of E. Washington are wheat, barley, hay, hops, and oats; and of W. Washington, oats, potatoes, hops, and hay. The wheat crop (1908) was 27,162,000 bu. There are also grown vegetables of all kinds. Flax, rye, Indian corn, and in a few places in central Washington some peanuts are raised. Hops thrive well, yielding 600 to 3,000 lb. to the acre. In fruits, the state excels in prunes, apples, pears, cherries, and the small berries. The acreage is increasing rapidly, and the surplus product is shipped to the E. states. Irrigation is revolutionizing agriculture in the central part of the state, and millions are being invested in irrigating works. In 1904 there were reported 178,000 acres of irrigated land. The principal crops produced in the sections reclaimed are fruits, alfalfa, hops, and vegetables. The timber wealth of the state is immense. The deliveries of timber (1907) by sea were 1,109,222,692 board ft., and the lumber cut by Washington mills in 1906 measured 4,305,053,000 board ft. The greatest product of the mines thus far has been coal; but gold, silver, lead, iron, copper, zinc, antimony, nickel, bismuth, and other metals are found in paying quantities. Granite, sandstone, lime, marble, and valuable clays are also found. Many of the mining districts abounding in precious metals are as yet only prospected and are awaiting railways to mature development. There are productive mineral springs at the Cascades, in Skamania Co.; Medical Lake, in Spokane Co.; and N. Yakima, Yakima Co. Valuable deposits of iron ore exist in the state, but mining is in its infancy.

Washington is divided into thirty-six counties. Important cities and towns are Seattle, Tacoma, Spokane, Walla Walla, Everett, Whatcom, Ballard, Fair Haven, Olympia, Vancouver, Aberdeen, Port Townsend, N. Yakima, Roslyn, Hoquiam, Port Angeles, Dayton, Colfax, Snohomish, and Republic. The principal manufacture in E. Washington is flour, large mills being located at Spokane, Walla Walla, Dayton, Waitsburg, Cheney, and other cities. The chief manufactures in W. Washington are lumber, iron, brick, and tile. Seattle and Tacoma are the chief manufacturing cities. The Northern Pacific and the Great Northern railways cross the state, and have branches in it, but pack animals are used for much internal transportation.

Every section of land numbered 16 or 36 is set aside for the maintenance of public schools. The aggregate is 2,484,480 acres, and none of it can be sold for less than $10 an acre. The proceeds from the sale of these lands constitute a fund, having a minimum value of $24,844,800, only the interest on which can be used. In 1903 there were about 180,000 children enrolled in the schools. Besides the public schools, there are over fifty colleges, endowed academies, and private schools. The colleges include the Univ. of Washington, Colfax College (Baptist), at Colfax; Whitworth College, at Sumner; Whitman College (Congregational), at Walla Walla; and St. James's College (Roman Catholic), at Vancouver. There are state normal schools at Ellensburg and Cheney and an agricultural college and school of science at Pullman.

The state institutions comprise a soldiers' home at Orting, reform school at Chehalis, hospitals for the insane at Steilacoom and Medical Lake, a school for defective youth at Vancouver, and a penitentiary at Walla Walla. There are private and denominational hospitals, orphanages, homes, and other institutions, and a small penitentiary on McNeill's Island, belonging to the U. S.

The constitution provides that state officers shall be elected for four years at the same elections at which the vote is taken for President of the U. S. Much of the work of the state government devolves upon boards of trustees or commissioners. Each state institution has a board of trustees. There are boards to handle the state lands, to look after the state printing, to equalize the taxes, to appraise the tide lands, to regulate the practice of medicine, etc. These officers are appointed by the governor. An elector must be a male citizen of the U. S., and must reside in the state one year, in the county six months, and in his voting precinct thirty days before being entitled to vote. For a brief period in territorial days the suffrage was extended to women, but it was withdrawn before statehood, though women are allowed to vote at school elections.

Along the seacoast are found names that perpetuate the memory of the earliest Spanish voyages to the Pacific NW., such as the Strait of San Juan de Fuca and San Juan Islands. The greater number of names, as Vancouver Island, Puget Sound, Mt. Rainier, etc., commemorate the more complete work of the English navigator George Vancouver. Gray's Harbor and Columbia River are named after Capt. Robert Gray and his vessel, the *Columbia*; he discovered both in 1792 while on the first voyage of exploration in the Pacific NW. by and for Americans. These discoveries gave the U. S. a claim to at least a large part of the territory now embraced in Washington, but title was not made perfect until 1803, when the U. S. purchased from Napoleon I the Louisiana Territory, which cleared the last controversy, except trifling differences, with Great Britain as to boundaries between the U. S. and British America. The Lewis and Clarke overland expedition made valuable discoveries in 1803–05. The Hudson Bay Company long operated in this region, and remains of their forts and buildings still exist. The American Fur Company, John Jacob Astor's Pacific Fur Company, and other enterprises sought this field in the early nineteenth century. Washington was a part of the Territory of Oregon until 1853, when a part was set off and organized as Washington Territory. Two years later white settlers experienced much trouble with Indians in different parts of the territory. Washington was admitted into the Union November 11, 1889.

Washington, capital of the U. S. of America and seat of the Federal Government since 1800; coextensive with the District of Columbia; on the Potomac River. The District of Columbia is bounded N., NW., E., and SE. by Maryland and W. and SW. by the Potomac, which separates it from Virginia. Area, over 69 sq. m., 60 of which are land. The area of the city proper amounts to 6,654 acres, of which the Government reservations comprise 405 acres, while the avenues and streets embrace 2,554 acres, leaving only 3,152 acres to the squares on which private residences are built. There are 301 parks or reservations in all. The principal are Washington Park (Monument grounds), President's Park (in rear of the White House), Smithsonian Park, Judiciary Park, Garfield Park, and Lincoln Park. The water supply is brought by a capacious aqueduct from the Great Falls of the Potomac, 16 m. above. It affords 80,000,000 gal. daily, and cost $3,500,000. Washington is situated in part on the tongue of land lying at the confluence of two broad rivers, from which the ground rises into the expanded plateau of Capitol Hill, about 100 ft. above the Potomac. The city proper is surrounded on the E., N., and W. by an amphitheater of well-wooded hills, embracing in some cases the ancient forest growth.

The Capitol contains the chambers and offices of the houses of Congress, and the Supreme Court room and offices. The Congressional Library Building occupies a square just E. of the Capitol. It is built of white New Hampshire granite, three stories high, in the Italian Renaissance style. The dimensions are 470 by 340 ft., the building covering 3½ acres. The central feature of the interior is the reading room, an octagonal or nearly circular hall 100 ft. in diameter, its walls decorated with numerous beautiful arches of carved marbles. The book repositories opening out from the reading room accommodate 2,000,000 volumes, the ultimate capacity of the building being 4,500,000. There are four great inner courts, lined with white enameled brick, and the number of windows exceeds 2,000, rendering this the best-lighted library in the world. Copyright record rooms, Congressional reading rooms, a lecture hall, a department for the blind, map room, and an art gallery are other features of the building.

The Treasury Department, the Post Office Department, the Department of Agriculture, and the Department of the Interior occupy four large and imposing buildings, the latter using in addition the building formerly occupied by the Post Office Department. The State, War, and Navy departments occupy another large building. Other important Government buildings are the U. S. Naval Observatory, on Georgetown Heights, the Court of Claims, the Army Medical Museum, the Soldiers' Home, the Pension Office, the Weather Bureau, and the Printing Office. The Washington Navy Yard occupies 27 acres on the Anacostia River.

The President's house, known also as the Executive Mansion and the White House, is on Pennsylvania Avenue, occupying a reservation of about 20 acres, between the Treasury and the departments of State, War, and Navy. It is a plain edifice of freestone, painted white, 170 by 86 ft., with a colonnade of eight Ionic columns in front and a semicircular portico in the rear. The building is adorned by excellent portraits of the ex-Presidents of the U. S. The largest apartment, known as the East Room, is 80 by 40 ft. in dimensions and 22 ft. high. The adjoining Blue Room, an apartment finished in blue and gold, is devoted to receptions. The Green Room and Red Room are each 30 by 20 ft. The rooms of the second floor are occupied with apartments for the presidential family. The first President's house, begun in 1792, was occupied by Pres. Adams in 1800, and was burned by the British in 1814. The present edifice was constructed in 1818–29, and extensively remodeled in 1902–3, with a connecting building for the executive offices.

Among the many fine statues in Washington are Brown's bronze equestrian statue of Gen. Winfield Scott, Ball's bronze statue representing Lincoln freeing a slave in chains, and Greenough's marble statue of Washington. The only public institution devoted exclusively to the fine arts is the Corcoran Gallery of Art, Seventeenth Street and New York Avenue, opened with a collection of paintings, statuary, bronzes, and casts from the antique in 1873. The Washington National Monument (to commemorate the first President) was begun by an association incorporated by Congress. Its corner stone was laid July 4, 1848. After an expenditure of $230,000, raised by subscription, work was suspended. The monument was finished in 1885. It is built of great blocks of crystal Maryland marble, lined with blue gneiss, and rests on a foundation 104 ft. square and 37 ft. deep. The height of this monument is 555 ft. 5½ in. The weight of the whole structure, including foundation, is 81,117 tons of 2,240 lb.; cost, $1,187,710. A polished cap of aluminum covers the highest point. Within the monument are an elevator and stairway of 900 steps.

The Zoölogical Park lies along both banks of Rock Creek, to the NW. of the city. The site is extremely picturesque, and the variety of animals and birds here exhibited render it a most attractive resort. The Rock Creek Park, an extensive tract purchased by Congress in 1890 for $1,200,000, comprises 1,606 acres, stretching along the winding stream for miles.

There was a conflict in Congress in 1789–90 over the claims of rival localities for the seat of government, and the present site was selected as a compromise, Philadelphia being made the capital for ten years, while after 1800 it was to be established on the Potomac. After the cession of a Federal district to the U. S. by Maryland and Virginia, the site of the city and the location of the public squares and buildings were selected by Pres. Washington on the Maryland side of the Potomac. At the time of this location the city was nearly in the geographical center between the N. and S. limits of the Union. It was called the "Federal City" by Washington and in the records until September 9, 1791, when the commissioners directed that the Federal district should be called the Territory of Columbia and the Federal city the city of Washington. Major l'Enfant, a French engineer, prepared the plan of Washington City under the direction of George Washington and Thomas Jefferson. L'Enfant took as a basis for his design the topography of Versailles, the seat of the government of France, but with large modifications. On August 24, 1814, the city was captured by the British, who burned the Capitol and other public buildings. From 1802 to 1871 Washington was under municipal government, but in the latter year a territorial government was organized for the District of Columbia. In 1874 this in turn was abolished and the government placed in the hands of three commissioners appointed by the President, while Congress assumed direct legislative control over finance and improvements. During the Civil War Washington was the center of great military operations. The city was fortified by a chain of strong forts, sixty-eight in number, and it was a great depot for military supplies. Pop. (1910) est. at 345,000, including 97,483 of negro descent. See DISTRICT OF COLUMBIA.

Washington, Trea'ty of.

Washington Arch. See NEW YORK CITY.

Washington Mon'ument. See WASHINGTON, D. C.

Washington Univer'sity, an institution of learning at St. Louis, Mo.; incorporated in 1853. It consists of six higher departments—the undergraduate department, including the college (1859) and the polytechnic school (1870); the Henry Shaw School of Botany (1886), the St. Louis Law School (1867), the School of Fine Arts, the St. Louis Medical College (1891), and the Missouri Dental College (1892). The university also has three secondary schools—the Smith Academy (1854), the Manual Training School (1879), and Mary Institute, for girls (1859). The number of students in all departments in 1909 was 2,039; the number of instructors was 269. The special reference libraries include about 60,000 volumes.

Wash'ita Riv'er (frequently spelled OUACHITA), a stream which rises by its Brushy Fork in Polk Co., Ark., and flows first E. and then S., crossing the Louisiana state line and discharging into Red River. That part of Washita River between Tensas and Red rivers is sometimes called Black River. It is navigable to Camden, Ark., and for two thirds of the year to Arkadelphia, Ark. It is 600 m. long, and flows through a rich corn and cotton region. Its navigation is extensive and important. Another Washita, called also the False Washita, falls into the Red River at Washita Bend, above Preston, Tex.

Wasp, any one of a large number of insects (see ENTOMOLOGY) which are all essentially similar in the possession of a sting of no mean capacity at the end of the abdomen of the female. They have strong biting jaws, and the abdomen is either joined to the thorax by its whole breadth or by a slender connection. There are two well-marked groups of wasps, each containing many species: (1) The digger wasps, in which the wings are not folded when at rest, and (2) the true wasps, in which they are folded. In the first, the female usually constructs nests for the young by excavating holes in the earth or in wood, and in them she lays her eggs. The diggers are all solitary in habit—*i.e.*, each female works by herself in the nest making. In the nest she stores up food in the shape of insects, which she paralyzes, but does not kill, with her sting. On these the larva feeds until ready to go through its transformations. Each species has its peculiar habits in this respect, some storing the nests with spiders, others with beetles, others still with caterpillars. To the digger wasps also belong the mud daubers, which make nests of clay in barns, garrets, etc.

COMMON WASP.

Among the true wasps are some with all the habits of the diggers, boring in wood or earth, or making mud nests, each female working alone in this respect; while others are social in habits, and in the colonies of these forms we find, as in the ants and bees, males, females, and workers, the males alone being stingless. Most of the work is done by the workers, who build the nests either attached to the eves of buildings or to trees, or concealed in the ground. The best known of the true wasps are the "yellow jackets" or hornets, which construct large paper nests. The paper is obtained by tearing up weathered wood and mixing it with saliva, the whole forming a wood-pulp paper. The cells are arranged in combs like those of the honey bee. No food is stored up, however, and the adults feed the growing young on masticated insects which they have captured. Males and workers die in the autumn, while the females pass through the winter to form new colonies in the spring.

WASP'S NEST.

Watch, a timepiece designed to be worn or carried on the person, as distinguished from a clock, which is a stationary timepiece. (See CLOCKS.) The making of portable timekeepers dates from abt. 1500. The invention of the coiled mainspring is due to Peter Helé. In the case of a watch driven by a spring whose tension was diminished as the spring uncoiled, a uniform rate was impossible without devices to make the force uniform.

The first contrivance of this description was a sort of brake, so arranged that, as the spring unwound, less and less resistance would be applied. This was succeeded by the fusee, invented abt. 1525 by Jacob Zech, of Prague. It consisted of a sort of conical pulley having formed on its periphery a spiral groove. On the arbor of the fusee was fixed the main wheel, and the mainspring barrel served as a drum, around which was coiled a number of turns of a cord of catgut, one end of which was attached to the large part of the fusee and the other end to the barrel, so that the mainspring barrel was turned and the spring coiled up by turning the fusee. The use of chains in place of catgut was introduced in 1664 by Gruet, a Swiss. Enamel dials were introduced abt. 1630. Hooke invented the balance spring abt. 1658. Early watches had but a single hand. In 1850 Aaron L. Dennison erected a factory for the manufacture of watches by machinery, making large numbers of each part so uniform that they were interchangeable. A few watches were produced, but the demand was limited until the outbreak of the Civil War, when a demand for American watches began which has since continued.

A complete watch is made up of two parts —the case and the movement. The latter consists principally of a train of gear wheels and pinions, mounted between two metallic plates, commonly of brass or nickel alloy, in which the arbors of the wheels and pinions are journaled or pivoted. For symmetry of form and convenience in construction, as well as in practical use, this train of gearing is arranged as compactly as possible, and somewhat circular in form. (See Fig. 1.) At the right-hand extremity of this train is a large boxlike wheel, containing the coiled mainspring. In the ordinary form of construction the inner end of this spring is attached to the barrel arbor, while the outer end is connected with the barrel itself; the spring is wound up by turning the barrel arbor, and is prevented from immediately unwinding by a ratchet on the arbor. The action of the spring turns the barrel, the gear teeth of which mesh into the center pinion, the next member of the train. This second member is located in the center of the circular watch plates, and upon its axis is fixed the minute hand.

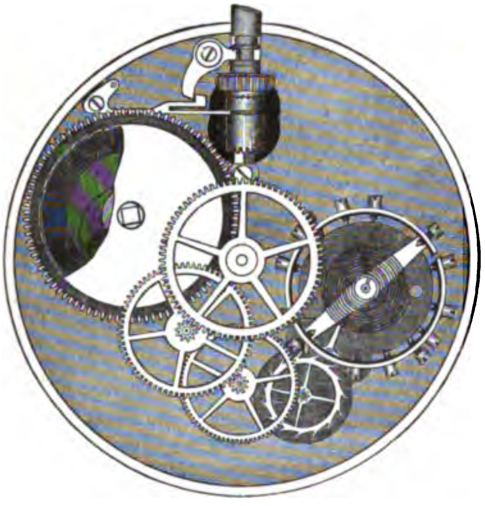


FIG. 1.—ARRANGEMENT OF TIME-TRAIN OF A ¾-PLATE, OPEN-FACE, PENDANT-SETTING WATCH.

Fixed to the staff of the center pinion is a wheel, known as the center wheel, which meshes into the third member of the train, called the third pinion. To this is also affixed a wheel, called the third wheel, which in like manner meshes into, and gives motion to, a fourth pinion and wheel. The fourth member of the train revolves at sixty times the speed of the center wheel and carries the second hand. The minute hand is mounted upon the axis of the second member of the train, and is fixed on the upper end of the cannon pinion, so called from its long body, or hub, and as the pinions in the time train proper are integral with the staves or arbors, which are solid and pivoted at their ends, the cannon pinion has an axial hole running its entire length, corresponding in size with the diameter of the projecting end of the center staff, upon which it is placed, being held by a sufficient frictional contact to carry the pinion and hand, and still allow of movement upon the staff, for the purpose of setting the hands. On key-winding watches the upper end of this cannon pinion is made square, and of the same size as the square end of the mainspring or barrel arbor, so that the same key may be used for setting the hands and winding the mainspring. In stem-winding watches the hand setting is performed by mechanism which may be thrown in gear with the stem at will, the same operation throwing the winding mechanism out of gear.

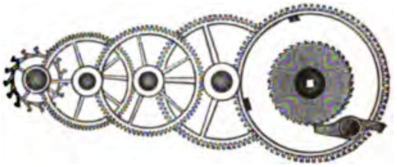


FIG. 2.—WATCH TIME-TRAIN ARRANGED IN A STRAIGHT LINE: From right to left in order, the members are (1) the barrel; (2) center wheel and pinion; (3) third wheel and pinion; (4) fourth wheel and pinion; and (5) escape-wheel and pinion.

For the mounting and movement of the hour hand, the teeth of the cannon pinion are made to engage with the teeth of a wheel which fits loosely upon a stationary stud projecting from the lower or pillar plate of the watch. The proportion in the number of teeth of this wheel and the cannon pinion is ordinarily three to one. Rigidly affixed to this wheel is a pinion, called the minute pinion, while the wheel is called the minute wheel. On the body or hub of the cannon pinion is loosely fitted a wheel having a projecting hub, upon the upper end of which is placed the hour hand. The teeth of this wheel are made to engage the teeth of the minute pinion before mentioned, their relative proportion being that of four to one, so that through the interposition of the minute wheel and pinion it will require twelve revolutions of the cannon pinion, carrying the minute hand, to produce one revolution of the hour wheel.

For description of the devices used in watches to secure a correct and uniform speed, see ESCAPEMENT.

Wa'ter, a tasteless, inodorous, transparent compound of hydrogen and oxygen (chemical formula H_2O). It assumes, respectively, the gaseous, liquid, and solid forms within the limits of natural temperatures, but is specifically called "water" only in the liquid state, being known as "ice" when solidified and in the gaseous form as "water vapor" (or as "steam" when above the boiling point). The term steam is also popularly applied to the fine droplets formed by the condensation of hot-water vapor in a cool atmosphere. This is really water in the liquid state, though very finely divided. The temperature of solidification, or "freezing point," of water at atmospheric pressure is 32° F. or 0° C. It is lowered by increased pressure by about .0075° C. for each additional atmosphere. Its boiling point, or the temperature when its vapor forms in bubbles within its mass, is 212° F. or 100° C. at atmospheric pressure, and rises with increased pressure, falling also when the pressure lessens. Water gives off vapor at its free surface at lower temperatures, and even when it is in the solid state. The tension of the vapor thus formed increases as the temperature rises. The warmer it is, the more of the vapor may exist in a given space. The amount of any other gas, as air, present does not affect this result. Thus in summer the air holds vastly more moisture than in winter. When the maximum amount is present the air is said to be "saturated," whether this amount be large or small, although, as has been said, the air has nothing to do with it. If heat be applied to water under continually increased pressure, it is found that it will become a vapor at 370° C., no matter how high the pressure. This is called the "critical point." Water "wets" most substances, by which is meant that its molecular relations with them are such that it freely flows over them instead of drawing itself together in drops, as it does on a greased surface, or as mercury does on a wooden table. It dissolves a very large number of solids and gases and mixes with many other liquids, being the chief ingredient in such familiar fluids as blood, milk, beer, vinegar, etc. It also readily unites chemically with many substances, and in some cases it is difficult to determine whether the mixture is physical or chemical. The solution of carbon-dioxide gas usually called soda water, for instance, is regarded by some chemists as a physical solution, like that of sugar or of atmospheric air in water, and by others as the formation of a chemical compound, carbonic acid ($CO_2 + H_2O = H_2CO_3$). Water is a component even of substances in the solid state, as in crystals, when it is called "water of crystallization." This may be removed by moderate heat, as when gypsum is turned into plaster of Paris.

Water may be decomposed into its component gases by various methods. Chemically, a substance having a strong affinity for one of the gases will unite with it, setting free the other, as when potassium takes up the oxygen, setting free the hydrogen, or when chlorin gas unites with the hydrogen, setting free the oxygen. It may also be decomposed by great heat or by passing an electric current through it when slightly acidulated (electrolysis). Water occurs on the earth's surface in various degrees of purity, and is known, according to the mode of its occurrence, as rain water, pond water, river water, spring water, well water, sea water, etc.; also as "soft water" or "hard water," as it contains fewer or more dissolved salts, especially those of lime. As the chemical action between lime salts and soap produces an insoluble precipitate, "hard" waters are not good for washing, and where no others are obtainable they are sometimes "softened" in quantity by chemical treatment. Rain water is very soft, but contains impurities washed from the atmosphere, and is not best for drinking. River water is usually soft, though it contains some salts, washed from the soil, and may carry much suspended earthy matter. These may be removed by filtration or settling, or sometimes by chemical precipitation (as with alum), to fit the water for domestic use. Pond or lake water is impounded brook or river water, and resembles it, except that the mud, if any, has settled out of it and vegetable matter from water plants is often present. Spring water, usually regarded as the purest obtainable, has undergone natural filtration by soaking through the soil. It thus is very free from suspended matter, but often "hard," and usually rich in dissolved salts, which give it an agreeable taste, whereas pure (distilled) water is "flat" and insipid. Where salts are present in quantity we have "mineral springs." Much underground water does not find an outlet in springs. This is often recovered by means of wells. An ordinary well is simply a narrow circular pit sunk until it reaches a place where there is a natural accumulation of water in the soil. A "driven well" is a tube driven into the soil until it taps a similar underground reservoir, generally much deeper. In both these cases the water must be pumped or mechanically raised. Sometimes the underground reservoir contains water under pressure, between two impenetrable layers. When such a supply is tapped, it rises of itself to the surface, and sometimes forms a fountain. This is an "artesian well," so called because first found in Artois, France.

When spring or river water containing dissolved salts forms a pond or lake without outlet, as may be the case where the surface evaporation is sufficient to balance the inflow, the salts accumulate and form a salt lake like the Dead Sea, the Great Salt Lake of Utah, or other smaller bodies. The origin of the salt sea water is precisely the same, the ocean being in effect a huge lake without outlet, holding in solution the salts of all lands washed down into it from time immemorial.

Water is now generally furnished to all houses in cities and towns through pipes, under pressure, from a reservoir, being often taken from sources many miles distant. The waste is disposed of through sewers, or sometimes, in smaller places, by accumulation in cesspools. See SEWERAGE. For other aspects of water, see WATER POWER, HYDRAULICS, HYDROSTATICS, STEAM ENGINE, WATER WHEELS, etc.

Wat'erbury, city, New Haven Co., Conn.; on the Naugatuck River; 21 m. N. by W. of New Haven. It owes its origin as a factory center to the Naugatuck River and several smaller streams that unite here, but these now provide a very small fraction of the power. The making of metal buttons was begun here 100 years ago, and for a long time the making of brass and German silver was, in the U. S., confined to this city. Waterbury is called the Brass City, and its buttons, plated ware, clocks, and watches are known all over the world. Pop. (1906) est. at 61,903.

Water Col'or Paint'ing, painting by means of color dissolved in water, some gummy substance being combined with the color to fix it upon the surface to be painted. Fresco painting is water color, and so is calcimining, such as is done upon ordinary walls and ceilings. The term is used especially for painting upon paper with colors prepared in advance by being carefully ground and mixed with gum. The colors are sold in hard cakes, in pans, and collapsible tubes. The admixture of honey and glycerin with the colors, by keeping them soft, meets the requirement of the artist for swift work, as in sketching. It has been held by some that opaque color such as has been got by mixing white with the paints is illegitimate, and is like a process of oil painting. These critics hold that the lights in water color should be got by the white paper showing through the work, which is to be kept as translucent as the pigments allow. The skill required by water-color artists is not inferior to that required by a painter in oil, but is in some respects different. The artist in water color requires greater swiftness and certainty of touch, and mistakes in drawing cannot be corrected or covered over, as on canvas: the lines and the processes stand revealed. The ease with which the painter in water color throws off sketches and produces startling effects with a few masses of light and shade, or a few bold gradations of tone, deludes many into the belief that this is a light and trifling branch of art. The method, in fact, is remarkably well suited to sketching, owing to the lightness of the materials and the rapidity with which the paper dries; the luminousness of the paper likewise greatly assists the immediate, superficial effect. But finished painting in water color demands skill of a very high order; great works come only from masters, and no master has exhausted or even severely taxed the resources of the method. Its permanency seems to be unquestionable. Water-color paintings—not tinted drawings, which are very different things—have been known to retain their freshness and brilliancy for ninety years, giving then no indications of weakness. The darkening of the paper on long exposure to the air may be partly avoided by protecting the surface with glass. See PAINTING.

Water Cress. See CRESSES.

Water Cure. See HYDROTHERAPY.

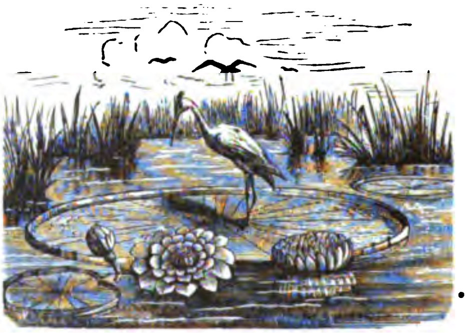
Water Dog. See MUD-PUPPY.

Water Gas. See GAS.

Water Glass. See GLASS, SOLUBLE.

Water Lil'y Fam'ily (*Nymphæaceæ*), a small group (thirty-five species) of herbaceous, aquatic, choripetalous dicotyledons, natives of all temperate and warm climates. The sepals are three to five, petals three to many, stamens six to many, and ovaries three to many, free, or united into a compound pistil. The stems are creeping and submersed and the leaves mostly peltate, long petioled, and floating. Fourteen species are N. American. The white water lily (*Castalia odorata*) is common in the E. U. S. The lotus, water chinquapin, or yellow nelumbo (*Nelumbo lutea*), occurs in the waters of the Mississippi Valley. It is curious on account of its large top-shaped receptacle, in the cavities of whose upper surface the pistils are imbedded. The common yellow water lily, or spatter dock (*Nymphæa advena*), has smaller, yellow flowers, with fewer petals. The Victoria lily, the largest of all, occurs in the waters of the Amazon region in S. America. Its peltate leaves are 6 to 10 ft. in diameter, with an upturned margin 2 in. in height. Its flowers are from 10 to 15 in. in diameter, pinkish and fragrant. The starchy seeds are eaten by the natives.

WHITE WATER LILY.



VICTORIA WATER LILY.

Waterloo', a village of Belgium, nearly 10 m. SSE. of Brussels. It is famous for the memorable battle which was fought there on June 18, 1815, and which finally shattered the power of Napoleon. The Prussian defeat at Ligny, and his own unsuccessful engagement at Quatre-Bras on the 16th of June, caused Wellington to retire toward Waterloo, while Blücher concentrated his troops at Wavre, about 10 m.

distant. The whole British position formed a sort of curve, the center of which was nearest to the enemy. The French forces occupied a series of heights opposite, there being a valley of no great depth, and from 500 to 800 yards in breadth, between them. Each army probably consisted of about 70,000 men. The troops of Napoleon were for the most part veterans, while Wellington had an army composed of troops of various nationalities (Belgians, Brunswickers, Hanoverians, Nassauers), that had never fought together, and a great part of his British troops (about 25,000) were raw levies.

The object of Napoleon was to defeat the British, or force them to retreat, before the Prussians, who he knew were coming up, could arrive on the field; while that of the Duke of Wellington was to maintain his ground till he could be joined by his allies, when it might be in his power to become the assailant. The French began the battle about noon, and it continued with great fury till evening, when the appearance on the scene of the Prussians caused Bonaparte to redouble his efforts. His Imperial Guards, which had been kept in reserve, made a final attempt. Wellington's line, however, charged them at the point of the bayonet, and the Imperial Guard began a retreat, in which they were imitated by the whole French army. The British left the pursuit to the Prussians. The whole French army was dispersed and disabled, and their artillery, baggage, etc., fell into the hands of the conquerors. Their loss in killed, wounded, and prisoners amounted to between 40,000 and 50,000. The allied loss amounted to 23,000 killed and wounded, of whom over 11,000 were British and Hanoverians, 3,000 Netherlanders, and 7,000 Prussians.

Wa'termelon, the fruit of a trailing annual vine of the cucumber family, a native of Asia and Africa, extensively found wild on the plains of the latter continent, where some varieties or specimens of its fruit are bitter and poisonous. Watermelons are largely grown in the U. S. for their cooling, watery pulp. In warm climates sugar has been profitably made from watermelons. A variety with hard, inedible flesh, the rind of which is used for preserves, is popularly known as citron.

Wa'ter Me'ter, an automatic device for measuring and registering the flow of water.

One of the most difficult problems in municipal engineering is to prevent wanton waste of the water supplied to the inhabitants at public cost. One of the practical forms is the disk meter, in which the water enters a round chamber and is forced by its own pressure to revolve a disk before it can reach the outflow, and at every rotation one half the contents of the chamber is discharged. The number of revolutions is registered by a series of clock wheels attached to the axle of the disk.

Water Mole, any one of the ornithorhynchidæ. See also DUCKBILL.

Water Oats. See RICE, INDIAN.

Water On'zel. See DIPPERS.

Water, Pollu'tion of, in law, a term used to express the dirtying or fouling of waters by a riparian owner or occupant to such an extent as to create a nuisance. Every owner of land through or along which a stream of water flows has the right to have the stream flow in its natural course free from such pollution as will materially affect the character of the stream, and a riparian owner who pollutes a stream so as to interfere with this right creates a right of action for damages.

Sources of pollution which have been held to create a right of action for damages, and also to afford a basis for an injunction restraining the pollution, are the discharge into the stream of muriatic, sulphuric, and other acids, dyes or dyewares, heated water which injures the character of the stream, blood, refuse, or foul matter from hogpens, lime pits, cesspools, etc.

Water Po'lo. See POLO.

Water Pow'er, power derived from water falling through a certain height whereby its energy is converted by means of hydraulic motors into useful work. Water privileges, as they are commonly called, exist on nearly all streams of any considerable magnitude, and in settled countries, where they have become developed or utilized by dams or otherwise, they are regarded as property having special value. On account of the variations of flow, a storage reservoir is necessary for water powers if the full average daily flow for the year is to be secured. The quantity of power which any privilege can furnish depends not only on the quantity of water, but also directly on the available fall. When the available head and the quantity of water which flows are determined, the total theoretical energy of the water for a given time is found by multiplying the number of pounds of water that flows during this time by the number of feet of fall. This will give the energy expended in foot pounds. If the time be one minute, and the number thus obtained be divided by 33,000, the theoretical horse power of the waterfall will be given.

The motors employed in connection with water powers are known as water wheels and water engines, the latter being used, however, only to a limited extent for small powers. Water wheels are classed as overshot wheels, breast wheels, undershot wheels, and turbines, the latter forming a distinct class of modern development which has superseded to a great extent the other classes. (See TURBINE; WATER WHEELS.) The great water powers of Holyoke, Lowell, Lawrence, Birmingham, and Minneapolis, in the U. S., may be referred to as illustrative on a grand scale of the value of improved water powers, while the mills scattered throughout nearly every populous district of civilized communities furnish examples on smaller scales. Yet a great many unoccupied and unimproved sites for valuable water powers remain. It has been estimated that the rivers of the U. S. can furnish about 200,000,000 horse power, while the amount utilized is only 1,500,000 horse power. The possibilities for the future are hence very great, and when coal becomes high in price water power is sure to take the place of steam. In addition an enormous amount of available power is wasted twice every day by the energy expended in the fall of the tides, and only the expense of deriving power from this source prevents its utilization. Water power is often sold by the " mill power," which in any particular case is defined by a certain quantity of water under a given head. At Holyoke a mill power is 38 cu. ft. a second under 2 ft. head, or 86 theoretic horse powers. At Minneapolis it is 30 cu. ft. a second under 22 ft. head, or 75 theoretic horse powers. At Holyoke the cost of one mill power for sixteen hours a day is $300 a year.

The possibility of transforming power into electric energy by means of dynamos and of transmitting it to considerable distances has given a marked impetus to the development of water power. Many cities are lighted and many lines of electric railway are operated by power thus transmitted through distances of from 5 to 20 m., while in one or two special cases the distance is over 100 m. The utilization of the power of Niagara Falls is an example. The mean discharge of the Niagara River above the falls is 230,000 cu. ft. a second. A vertical descent of 160 ft. occurs at the falls. The theoretic power of the falls is then about 4,000,000 horse power, nearly equal to all the power, both water and steam, used in the U. S. The value of the Niagara River as a possible source of power has always been recognized by engineers, but it was not until the end of the last century that the utilization of this power in large quantities became an accomplished fact. In 1909 the aggregate amount of power developed by the Niagara Falls Power Co. and its allied interest, the Canadian Niagara Power Co., was about 160,000 horse power, with additional capacity in course of construction amounting to 60,000 horse power. The cost of water power, when produced under favorable conditions, varies from one eighth to one fourth that of steam power. See HYDRAULICS.

Wa'terproofing, the art of rendering fabrics impervious to water. This result is usually obtained either by applying an insoluble coating upon the surface or by causing the formation of a compound that exerts a repellent action toward water in the pores of the article. One of the most important branches of this art is the application of India rubber in the preparation of mackintoshes and other waterproof wearing apparel. Woolen and other goods may be rendered waterproof by first saturating them with a solution of soap, then with a solution of alum, or by successive immersions in solutions of gelatin and galls (tannic acid), whereby the same compound that is formed in the tanning of leather is produced. Paper is rendered impervious to grease and water by immersing it, when unsized, in a solution of shellac in borax. The product obtained in this manner somewhat resembles parchment paper. The Japanese and Chinese prepare waterproof paper for umbrellas, water buckets, rain coats, etc., by treating it separately with solutions of potassium dichromate and glue, the gelatin being thus rendered insoluble.

Wa'ter Ram. See HYDRAULIC RAM.

Water Rat, or **Bea'ver Rat,** an animal of Tasmania resembling the muskrat in many particulars, and the back is of a dark rich brown, the belly of a golden yellow. It is an expert swimmer, frequents both salt and fresh water, is nocturnal in habits, and when eating supports itself upon the hind legs and tail.

Water Rice. See RICE, INDIAN.

Wa'tershed, a geographical term of somewhat ambiguous meaning, as it has been used in different senses by various writers. Some apply the term to the slopes of the land from which water is shed to a river, thus making every valley consist of two watersheds which unite along the stream line. Others, with the support of etymology and better usage, mean by it the line of water parting that separates the slopes on the two sides of a height of land. In the U. S. the word divide has come into general use; this lends itself better to derivative terms, such as "subdivides," the name for the numerous subordinate water partings between the minor streams of a river system; " undivided " areas, meaning the plain surfaces which are not yet dissected by streams, and from which the rainfall is disposed of more by penetration into the soil or by evaporation than by run-off. These are by no means rare.

Wa'ter Span'iel, any one of several breeds of the spaniel, distinguished by fondness for swimming. They have rather long, curled hair, which has an oily feel and turns water very well. They are used by sportsmen for fetching out of the water the game which they have shot, or of swimming to the opposite bank of a river or to an island and starting therefrom the various birds that love such moist localities. The Irish water spaniel is a dark brown, frequently with a white spot on the breast.

Water Spout, a diminutive whirlwind, lasting from a few seconds to an hour, and reaching down from the under surface of a cloud to or nearly to the surface of the earth. In the center of this whirlwind appears a slender column of water or dense vapor, constituting the water spout proper. The column is probably hollow, and the air whirling around it is sometimes an ascending, but more frequently a descending, current. Water spouts are most frequently seen in tropical seas, but are by no means rare in higher latitudes. As many as twenty spouts have been seen within an hour, from five to seven at the same time. It is generally believed that the firing of a cannon or any violent concussion of the air will dissipate water spouts, but cannon have been discharged directly at spouts without such results.

Wa'tertown (settled in 1800, incorporated as a city in 1869), capital of Jefferson Co., N. Y.; on the Black River, 71 m. N. of Syracuse. The principal business interests are connected with agriculture through the fertile surrounding district, while the water power furnished by the Black River is used for many paper and flour mills. There are deposits of limestone and iron ore in the vicinity. Pop. (1905) 25,447.

Wa'ter Wheels, wheels for utilizing the energy of a waterfall, the water entering the wheel only upon a portion of the circumference. Water wheels are usually vertical, turning upon horizontal axes. When the water enters around the entire circumference the wheel is called a turbine; these are usually horizontal. Turbine wheels are more extensively used than all other kinds of hydraulic motors; they are described in the article TURBINE.

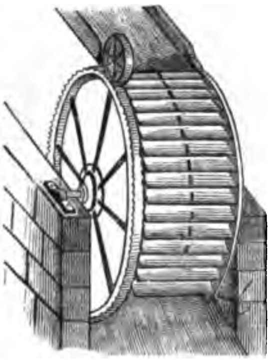


FIG. 1.—OVERSHOT WHEEL.

The overshot wheel is an old form especially adapted to high falls. The water from the reservoir is led through a feeding canal to the upper part of the wheel, where it falls into buckets. The action of the water is then almost entirely that of weight, and the work performed is closely equal to the weight of water multiplied by its fall in the wheel. The overshot wheel revolves slowly, but its efficiency is high, from eighty to ninety per cent of the theoretic work being utilized. On account of its large size and the liability to become clogged with ice in the winter time it has been mostly superseded by turbines. One of the largest overshot wheels is that at Laxey, on the Isle of Man; it is 72½ ft. in diameter, and develops 150 horse power.

The breast wheel is similar to the overshot wheel in general appearance, but it receives the water near the middle of its height instead of near the top. The water acts mainly by weight, but also to a certain degree by impulse, at the point of entrance. Its efficiency is from seventy to eighty per cent of the theoretic work.

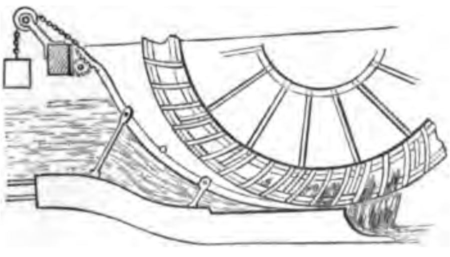


FIG. 2.—PONCELET'S UNDERSHOT WHEEL.

Undershot wheels in great variety have been constructed. The form devised by Poncelet has a curved sill and guide by which the water is directed against the vanes, and its efficiency is from sixty to seventy per cent. In these wheels the water acts almost entirely by its impulse.

Vertical impulse wheels or water motors, which are driven by a stream of water issuing from a nozzle under high pressure, have been developed since 1880, and are highly advantageous on account of their small size and consequent portability. The water is brought to the wheel through a pipe or hose, and delivered against a series of small buckets on the circumference. The velocity of revolution is rapid. A Pelton wheel at the Sutro Tunnel, in Nevada, 36 in. in diameter, is driven under a head of 2,100 ft., and makes 1,150 revolutions a minute, a stream of water from a nozzle ½ in. in diameter furnishing nearly 100 horse power.

The principles of the design of water wheels may be summarized by saying that the water should enter the wheel without shock and leave without velocity. See WATER POWER.

Wa'terworks, constructions and appliances for the collection, preservation, and distribution of water for the supply of communities. For the supply of large communities, access to streams of a size sufficient to furnish the required quantity at all times cannot usually be had; and when possible the stream is ordinarily exposed to contamination, which makes its use objectionable. The most suitable sources of supply are small streams in sparsely inhabited districts. The flow of such streams is enormously variable, being sometimes as much in an hour as at other times in a month, so reservoirs are made to hold about four months' supply. Much water is also obtained from deep wells, especially in Europe, but are not much used in the U. S., except for supplying pure water to paper mills, breweries, etc. Water supply is applied to domestic use, trade supply, and watering. The daily use and waste of water per person is estimated in gallons as follows: New York, 79; Chicago, 140; Philadelphia, 132; St. Louis, 72; Boston, 80; Washington, D. C., 187; while among English cities the figures are: London, 39½; Manchester, 26; Glasgow, 60; Liverpool, 31. The highest consumption in England is about equal to the lowest in the U. S. This is due in some degree to the generally wasteful habits of Americans, but more especially to the fact that in European towns consumers of water are usually under some control and restraint in its use. In the U. S. such restraint is rarely exercised, and reckless and wanton wastefulness prevails, and the evil is constantly growing.

The conduit or aqueduct conveys the water from the source to the distributing reservoir in or near the city. In extensive works it is ordinarily of masonry, not being intended to sustain any pressure. It is built to a nearly level grade, having only sufficient inclination to give motion to the water. Intervening ridges are cut down or pierced by tunnels. Valleys are crossed by embankments of earth, or earth and masonry combined, or by rows of arches. In crossing deep valleys or rivers the masonry of the aqueduct is sometimes interrupted, and the water flows in iron pipes, which descend into the valley and rise and reënter the aqueduct on the opposite side. In the ancient aqueducts, where, from the limited knowledge of ironworking, such expedients could not be adopted, these crossings required ranges of arches supported by piers of enormous height, constituting the most remarkable monuments of ancient civilization (see AQUEDUCT). Small conduits are often made of earthenware pipe.

A pumping system usually has a conduit, not essentially different in construction from that required in a gravitation supply, though it ordinarily forms a much less important feature of the system. Its purpose is to convey the water from the source to the pump well, which can usually be located so as not to require a great length of conduit. In waterworks for cities located on the shores of the Great Lakes, and drawing their supply therefrom, the conduit forms a very important feature. The water cannot be taken from any point near the shore, as it is liable to be contaminated by sewerage and turbid on account of the action of waves. To procure water free from the latter source of impurity, the conduit must extend a long distance into the lake, as it is only in water of considerable depth that the waves cease to act upon the bottom. A solid structure built into the lake would require the strength and solidity of a breakwater, and even in that case would not be sufficiently permanent and free from settlement to serve as the foundation of an aqueduct. The method adopted at Chicago and other lake cities has been to extend a tunnel under the bottom of the lake to the desired point. In a pumping system the pipe leading from the pumps to the reservoir is called the force main. A standpipe is simply a vertical pipe communicating with the force main, and rising to a height greater than that corresponding to the pressure in the distributing pipes. It sometimes consists of two pipes communicating with one another at their summits.

The Holly system of waterworks has neither reservoir nor standpipe. The pumps work directly into the distributing pipes, and when the pumps stop the supply ceases. An automatic device controls the speed of the pumping machinery according to the pressure in the mains. It is claimed that this system maintains a pressure sufficient for domestic purposes at all times, and on the occurrence of a fire the pressure can in a few minutes be raised to a point which will enable the latter to be controlled by streams from the hydrants without the use of fire engines.

The pipes lying in the common streets and thoroughfares are called mains; those leading from the latter to the premises of consumers are called service pipes. Distributing mains of wood, lead, stone, earthenware, and asphaltum have been used at various times. The water of London was once distributed in wooden and lead pipes. The water from Jamaica Pond was distributed in Boston in wooden pipes before the introduction of the supply from Lake Cochituate. The depth to which pipes are covered varies with the climate. In different parts of England from 2 to 3 ft. is considered to afford sufficient protection from frost. In St. Paul, Minn., 7 and 7½ ft. are found sufficient. In the adjacent city of Minneapolis, which has a very loose, gravelly soil, the pipes are laid 8 ft. deep, and give great trouble from freezing. In Montreal the authorities are content with a depth of 6 ft., though much trouble is experienced from frost. In Quebec the pipes are laid 8 and 10 ft. deep. The most important precaution to be observed in the introduction of service pipes is to secure protection from frost. The pipe usually passes from the main directly into the cellar. In houses having open areas, it is hardly possible to secure sufficient depth. The pipe is usually provided with a cock just inside the cellar wall, by which the water can be shut off and discharged from the portion within the cellar, as city cellars are rarely frost proof. Freezing usually takes place at or near the cellar wall. For this reason the pipe is often so made that it can be separated at this point and thawed out by injecting hot water through a long, small pipe. A service pipe should, by preference, enter at the sunny side of a house, as the ground freezes less deeply there.

The installing of a special supply of sea water for use on the streets for flushing sewers, as well as for extinguishing fires, has been found in New York City to be an economical method of lessening the drain on the supply of pure water. See WATER METER.

Wat'son, John (pen name, IAN MACLAREN), 1850–1907; English minister and author; b. Manning-tree, Essex, England; educated at Edinburgh Univ., 1866–70; studied theology at New College, Edinburgh, and at Tübingen, Germany; minister of the Free Church in Logiealmond, Perthshire (the *Drumtochty* of his stories), in 1875; collegiate minister of St. Matthew's Free Church, Glasgow, 1877–80, when he was called to Sefton Park Presbyterian Church, Liverpool. In 1893 he began writing under the name of *Ian Maclaren*; was author of "Beside the Bonnie Brier Bush," "Auld Lang Syne," "Kate Carnegie," "The Mind of the Master," and "The Cure of Souls," the last being lectures delivered at Yale in 1896.

Watt (wŏt), **James,** 1736–1819; Scottish inventor. In 1758, when he was instrument maker to the Univ. of Glasgow, he began his experiments with steam as a propelling power for land carriages, which he temporarily abandoned, his first road engine being patented in 1784. He was afterwards employed as a surveyor and engineer. In 1774 he became a partner of Matthew Boulton, founder of the Soho works near Birmingham, and in 1775 they began to make improved steam engines. The invention of the crank and fly wheel is disputed between Watt and Pickard, but to Watt is due the credit of inventing the separate condenser, the double-acting principle, parallel motion, the regulating action of the governor, and many more improvements.

Watt's inventions in connection with the Newcomen engine, the improvements upon which constitute his claim for distinction, have made that machine the prime mover of the world. He adapted it to its original purpose, the pumping of water from mines, etc., gave it enormously greater economy in use of steam and fuel than it had in the hands of Newcomen, and applied it to the rotation of a shaft, and thus made it applicable to the driving of every sort of machinery, thereby making possible the steamship, the steam locomotive, the modern railway, and the whole system of manufacturing industries.

Watteau (vät-tō'), **Jean Antoine,** 1684–1721; French painter. He gained fame in 1717 by his "Embarking for Cythera," exhibited on his admission to the academy. His delineations of the costumes, manners, and life of the latter part of the reign of Louis XIV and under the regency are singularly faithful and brilliant; and his *fêtes élégantes*, pastoral pieces, and genre pictures are remarkable for grace and originality. He early developed an elaborate system of painting the whole picture in middle tints and then adding touches, sometimes of more vivid color and sometimes of high light, the ground painting showing between the new touches and giving great harmony and the effect of brilliant color, while yet there is but little pure red, blue, etc. As a technical artist Watteau ranks very high; there are few more consummate workmen. His subjects are always parties of richly dressed women distributed in groups in shaded groves, elegant picnics, country processions, masked balls, and courtly scenes of all sorts.

Watts, George Frederick, 1817-1904; English painter; b. London; studied at the Royal Academy, and later in Florence, and in 1847 won a prize of £500 in London for a cartoon representing "Alfred Inciting the Saxons to Prevent the Landing of the Danes," now in the House of Parliament; painted important frescoes in Lincoln's Inn and other buildings in London; was also a sculptor. He is, however, known chiefly as a portrait painter, some forty of the most distinguished men in Great Britain having sat to him, and by his imaginative compositions, one of which, "Love and Life," was presented to the U. S. Govt., and is now in Washington. He was elected a Royal Academician in 1868, received first-class medals at the Paris Exposition of 1878, and at that of Antwerp in 1885; Legion of Honor, 1878. He donated most of his pictures to the British National Gallery.

Watts, Isaac, 1674-1748; English minister and hymn writer. In 1698 he was assistant minister of an independent congregation in London, of which he became pastor in 1702. His health being impaired, he went in 1712 to live with Sir Thomas Abney, a London alderman, in whose family he remained as a guest till his death. His "Logic, or the Right Use of Reason," and his "Improvement of the Mind," are his most important prose writings; of the others, the best known is a work on the Trinity. His poetical works include "Hymns and Spiritual Songs," "Psalms of David," and "Divine Songs for the Use of Children."

Waves, forms assumed by a medium whose particles are in systematic oscillation, under the influence of gravity, elasticity, or other forces. In water waves the impelling force is gravity in large waves, and surface tension in small ones, or *ripples*. In sound waves it is elasticity. In ether waves (light, heat, etc.) it is also elasticity on a mechanical theory, but electric force on the electric theory, now generally accepted.

The distinguishing characteristic of any wave is that the wave form has motion apart from that of its constituent particles. Thus in the most familiar waves—those in water—the water particles move in closed curves, which are circles on the free surface; but the form of the wave itself moves forward indefinitely. A wave is defined by its *wave length, frequency* (*wave number*), *height*, and *speed*, which are not all independent quantities. In a water wave, the *wave length* is the distance from crest to crest, or hollow to hollow; the *frequency* is the number of times a second (or other stated time unit) that each particle oscillates; the *height* is the distance from hollow to crest, and the *speed* is the time taken for a crest to move forward over any stated unit of distance. This time obviously depends on the time of a single oscillation of the component particles. Thus, if the wave length is 10 ft. and the speed 5 ft. a second, one crest will move forward to the position occupied by another in two seconds, and this must also be the time occupied by a water particle in moving from its highest position to its lowest.

The simplest wave form is that of a sine curve or simple "wavy line." Complex forms are due to the combination of two or more waves having different wave lengths. When two similar waves moving in opposite directions combine, the result is a *stationary wave*. Such a wave does not move forward, but hollows simply change into crests and the opposite. Particles at these points have the maximum of movement, and midway between them are points where the particles do not move at all. The latter points are called *nodes*; the sections between them *loops* or *ventral segments*. In water waves the movement of the particles is, in general, at right angles to the path of the wave. In the waves that transmit sound, whether through a solid, a liquid, or a gas, they move to and fro in the same line as that of the wave path, and hence we have, instead of crests and hollows, points of compression and points of rarefaction. For purposes of diagrammatic representation, however, the corresponding water-wave line is often used. In a *stationary wave* of this type, the nodes are points where compression gives place to rarefaction, the particles remaining at rest, and the loops are segments of maximum motion, first in one direction and then in the other. In ether waves, the mechanical motion (or the electro-magnetic flux) is always in a plane at right angles to the wave path or "ray," but may be in any or all directions within that plane. No phenomena indicating motion in the line of the ray have ever been detected.

Two waves may so combine as to produce the effect of absence of wave motion. In order to do this they must have the same frequency, height (or intensity), and speed, and must be precisely half a wave length apart. Thus two tidal waves combine in some localities to produce the effect of absence of tide. So, also, two sounds of the same pitch (wave length) may produce silence, and two light waves of the same color may produce darkness. This phenomenon is called *interference*.

Waves may be *reflected, refracted*, or *diffracted*. In general the first two effects take place whenever a wave in one medium meets the surface of another medium. In this case two new waves are formed, one of which (the *refracted* wave) goes forward in the new medium at a new velocity and generally with an altered direction, while the other (the *reflected* wave) returns through the original medium at the same velocity. Where disturbance of a medium takes place at a single definite point, a wave spreads uniformly from that point in circular form, when the point is on a surface, as when a stone is cast into water. When the disturbed point is wholly within a medium, as when a sound is produced in air, the wave spreads in spherical form. When a wave with a straight or plane front is advancing, every point in the front may be supposed to tend to generate a circular or spherical wave of its own, but interference destroys the motion in all directions except straight ahead. But if the wave front meets a screen with a small aperture or slit, then the particle that encounters the slit is free to spread its circular or spherical wave on the other side of the screen, and does so. This is called *diffraction*, and takes place to a marked extent only when the slit is nearly as small as the wave length. In the case of light, therefore, a very narrow slit is required to show it. This is the mechanism by which a wave "turns corners." Because of it an obstacle will not cast a "shadow" unless it is much larger than the wave length. To cast a "shadow" from a water wave, a large object, such as a promontory, is required. A post offers no opposition to the wave, which merely washes around it. Almost any object is large enough to cast a light shadow, because the wave lengths here are all very small; but an object of considerable size, such as a house or barn, is required to throw an appreciable "sound shadow," because the wave lengths here are much greater. Waves of special kinds are treated more in detail in the articles on LIGHT; SOUND; SPECTRUM; TIDES.

Wax, a term given to several substances chemically unlike, but resembling each other in the properties familiar in the wax of bees—for example, animal wax and vegetable wax. The vegetable world furnishes numberless waxlike bodies, only a few of which have been carefully examined, almost every plant, in fact, secreting a waxlike substance, especially in the seeds or in the fruit. The animal kingdom furnishes (1) the typical beeswax; (2) a kind of insect wax from the Orinoco and Amazon valleys, known as Andaquies wax; (3) Chinese wax, formerly supposed to be of vegetable origin; and (4) spermaceti.

Beeswax.—This is the wax of which bees form their cells. (See BEE.) Common beeswax is yellow, has an agreeable and peculiar smell, feels a little greasy, but more sticky, and molds readily under the warmth of the fingers. Light bleaches it if exposed in thin sheets. It then becomes white wax, and is somewhat less fusible than before. Beeswax is freed from honey and adhering impurities by melting and stirring with water, which dissolves the traces of honey; the heavy solids fall to the bottom, and the wax forms a cake on the top of the water. Bleached wax fuses at about 145° F. It is insoluble in water, but dissolves readily in oils, fats, and essences.

The uses for wax are numerous and important. Its property of preserving tissues and preventing mold or mildew were well known to the ancients, who used cere cloth for embalming, and wax for painting, as in the wall pictures of Pompeii. Wax candles and tapers play an important part in the processions and ceremonies of the Roman Catholic Church. Wax is used in making glazed, ornamental, and wall papers and on collars and cuffs for polishing the surfaces. It is used in varnishes and paints, and for the "stuffing" of wood which is to be polished, as for pianos, coachwork, fine furniture, and parquette floors. Electrotypers use wax in forming their molds. Wax is an important ingredient in preparations for covering surfaces of polished iron and steel to prevent rust. Combined with tallow, it forms the coating of canvas and cordage to prevent mildew, as in sails, awnings, etc. Artificial flowers consume much wax, and its use appears to be extending.

Under the so-called fossil wax are several distinct minerals belonging to the ethylene series—one especially of which (ozokerite) is of importance as a substitute for beeswax, which in many physical properties it much resembles. Ceresin is a trade term applied to the purified ozokerite. It is used for all purposes for which beeswax is employed, and by its higher melting point is capable of uses to which the former is not adapted. It is said not only to retard, but entirely to prevent, rancidity in ointments—a most valuable quality. Large deposits of ozokerite have been found in Utah, and the product from this source is about 350,000 lb. annually.

Wax, Veg'etable, product of various plants, used as a substitute for beeswax. (1) Myrtle wax, produced from the bayberry or wax myrtle. (2) The wax of the Carnahuba palm, *Copernicia cerifera* of Brazil, used in Europe in candle making and for waxing floors and furniture. (3) The abundant and rather resinous product of *Ceroxylon andicola*, a fine palm tree of the Andes, is used for candles when mixed with tallow. (4) The Japan wax, produced by boiling the seeds of *Rhus succedanea*, a sumac tree. It closely resembles beeswax, and is used in candle making. It should not be confounded with China wax, which is an insect product.

Wax Myr'tle. See BAYBERRY.

Wax Palm, a name given to various wax-producing palms, especially to a magnificent tree, native of the Andes.

Wax Plant, a climbing greenhouse shrub of the milkweed family, a native of the E. Indies, deriving its name from the waxlike appearance of its clustering white flowers.

Wax'wing, name applied to a genus of birds because the inner wing feathers and occasionally the tail feathers are tipped with little appendages like flattened drops of red sealing wax. These are borne by both sexes, and, while they are usually best developed in old birds, are found in the young as well. The waxwings are 7 or 8 in. in length, the plumage is thick, soft, and of a peculiar brownish ash above, ranging from ashy to almost cinnamon brown. There is a long-pointed crest. There are three species, the cedar bird of N. America; the Asiatic, found in NE. Asia and Japan; and the Bohemian waxwing, which occurs in the N. of Europe, Asia, and N. America. They prefer fruit and berries, but also eat worms and insects. See CHATTERER.

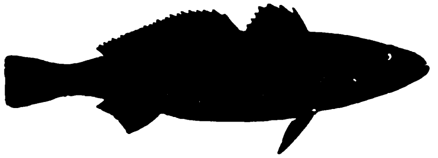
BOHEMIAN WAXWING.

Wax'work, a plant. See BITTER-SWEET.

Wax'y Degenera'tion, a diseased condition of certain tissues of the living body, in which parts of organs are changed into the substance known as amyloid. Organs seriously affected by waxy degeneration, when cut, have a half transparent look. The spleen, liver, and kidneys are frequent seats of the disease, and it is prone to occur in tuberculous persons and in those in whom there has been long-standing suppuration.

Wayne, Anthony, 1745–96; American soldier; b. Chester Co., Pa. In 1774 he was a member of the Pennsylvania Convention, and was elected to the legislature. He raised a regiment of volunteers in 1775, was colonel, joined Gen. Sullivan in Canada in 1776, and was conspicuous in the battle of Three Rivers; made brigadier general, May, 1777; joined Washington in New Jersey, and was prominent in the succeeding campaigns. On the night of July 15–16, 1779, with extraordinary boldness, he surprised and captured the garrison of Stony Point on the Hudson. He assisted in the capture of Cornwallis, and soon after was assigned to command in Georgia. After the war he retired to his farm. In 1792, he was appointed major general and commander in chief in the war against the W. Indians; gained a signal victory over the Miamis in August, 1794, and concluded with them the Treaty of Greenville, by which the U. S. acquired a large territory. On account of his bravery and apparent rashness he was popularly called "mad Anthony Wayne."

Weak'fish, called also SQUETEAGUE; very common along the E. coast of the U. S. The weakfish is distinguished by its color, which above is pale brownish, with a decided greenish tinge, grading below into silvery; on the back and sides are irregular blotches disposed in an oblique direction, tending forward and downward; the fins are yellowish and neutral. It averages between 1 and 2 ft. in length, and is found along the entire coast S. of Cape Cod, but is most common in the warmer waters. It does not ascend into the fresh waters. It is a rather voracious fish, and readily seizes the hook, but its mouth is easily torn, and to this characteristic (weakness of mouth) the name refers.


COMMON WEAKFISH.

Wea'sel, any one of various small carnivorous animals. Weasels are among the boldest and most bloodthirsty of carnivorous animals, and especially destructive to poultry, which they generally seize by the neck, proceeding to devour the carcasses leisurely after sucking their blood, or perhaps leaving, satisfied with quenching their thirst for blood alone. The species are mostly confined to cold and temperate regions, although a few extend into tropical countries. The generally recognized species in N. America are the little weasel, the bridled weasel of the SW. U. S., and the long-tailed weasel of New York. One species closely resembles the ermine. In summer its color is brown with a black-tipped tail, but in winter it changes to pure white except the tip of the tail, which remains black. See also ERMINE.

COMMON EUROPEAN WEASEL.

Weath'er, the current or passing state of the atmosphere, especially the conditions which affect man and his interests. It differs from climate, which represents the average of these conditions, or the average of all weathers. Climate changes slightly and slowly, but weather is constantly changing. The descriptive terms applied to weather—as cold, warm, dry, damp, wet, calm, windy, rainy, snowy—do not require special definition, and are used in a relative sense. For instance, what would be called cool weather in Cuba might be very warm weather at Mount Desert in Maine; and what would be called dry at Greytown, Nicaragua, would be damp or wet at Santa Fé, New Mexico. By settled weather is meant a condition in which there is little intensity and little change in the meteorological elements from day to day. The opposite is variable weather. The weather of the S. states and the Pacific coast is relatively settled; the most variable weather in the U. S. is along the N. boundary from the Rocky Mountains eastward. A spell of weather is the continuation of one type, especially in regions of variable weather, and a change of weather is the change from one type to another.

Weather is often named by a sort of metaphor referring to its effects. Thus fair weather is originally one suited to ordinary commercial operations, but it has been modified in its use by the U. S. Weather Bureau to indicate the absence of rain and of complete cloudiness. Foul weather is that unsuited for such operations, generally rainy and windy; dirty weather is that with low-flying clouds and slight driving rains; soft weather is that when the snow by melting, or the soil by rain, has softened and impedes travel. Again, weather is bright, sharp, tonic, sweltering (or sultry), according to its physiologic, and dull, close, gloomy, according to its psychic, effects. The weather preceding an approaching storm is especially noted for its effects in producing neuralgic and rheumatic pains, and this is, in large part, due to the increasing humidity. Indeed, changing humidity, by changing the rate of evaporation of the surface of the skin, and consequently its temperature, profoundly affects the individual and contributes largely to his comfort or discomfort. It is this which makes the difference between the bright and cheerful hot weather of arid regions (with temperature perhaps at 110° F.) and the muggy, insufferable weather—close, moist, and sweltering, though the thermometer may be at only 95° F.—which precedes summer thunderstorms in the E. states. The temperature of evaporation is substantially the temperature that is felt, and it is this that makes the hot weather of New Mexico quite as endurable as that of Ohio. See CLIMATE; METEOROLOGY; WEATHER BUREAU.

Weather Bu'reau, a branch of the U. S. Department of Agriculture, established July 1, 1891, to take charge of the meteorological work of the Government which had grown up since 1870 under the Signal Service of the Department of War. This bureau is intrusted with the forecast of the weather, storms, and floods, with the distribution of such warnings, and with the compilation and distribution of such data as are required by the public interest. The bureau has about 1,000 paid employees, the most of whom devote their entire time to its service. Its annual cost has been on the average $838,100. The annual saving resulting from the work of the bureau cannot be estimated with certainty, but is many times the cost. The percentage of correct forecasts varies, but the general average is four out of five. It is lowest in ordinary weather and highest in storms or severe weather of any sort. In hurricanes from the W. Indies it sometimes reaches one hundred per cent. Under the U. S. Weather Bureau is a Federal system of state services which perform efficient aid in collecting information of a detailed character. The most of the civilized states now have weather services, all a development since 1870, but the function of weather forecasts attracts most attention in the U. S., Great Britain, France, Prussia, Saxony, and Russia.

WEATHER SIGNALS are a code of signals, consisting of flags, cylinders, and cones, or whistles, adopted by the various national meteorological services to convey their forecasts of temperature, weather, and storms to the general public. The U. S. code consists of a series of flags for weather and temperature, a series of whistles from stationary engines for the same, and a series of flags for wind. The first two are used inland, the last at the ports.

The flag signals for weather and temperature are: (1) A square white flag for clear or fair weather; (2) a square blue flag for rain or snow; (3) a square flag with the upper half white and the lower half blue for local storms; (4) a black triangular flag for temperature, above the others when the temperature is to rise, below when it is to fall; (5) a white square flag with a black square in the center to forecast a cold wave; (6) a red square flag with a black square center to forecast a severe storm; (7) a red pennant as an information signal at ports is also used in Sacramento and San Joaquin valleys in California to indicate the approach of a "hot norther." These signals can be distinguished only within a radius of two or 3 m. (at the farthest), are invisible directly to windward or leeward, or in a calm, soon become too discolored to distinguish, and wear out rapidly.

The whistle signals are in some respects better. They are blown at fixed hours, and to one listening for them can sometimes be made out at a distance of 10 m. The first whistle, to attract attention, is a long blast of from fifteen to twenty seconds' duration. After this warning signal has been sounded, long blasts (of from four to six seconds' duration) refer to weather, and short blasts (of from one to three seconds' duration) refer to temperature, those for weather to be sounded first.

Blasts.	Indicate.
One long	Fair weather.
Two long	Rain or snow.
Three short	Local rain.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

For the ports the storm signal (square red with a black center) is combined with a pennant which indicates the direction of the wind. A red pennant above the storm signal indicates NE. winds; below, SE. A white pennant above, NW. winds; below, SW. winds. Two storm signals one above the other is the forecast for a hurricane, or for the very severe and dangerous gales which sometimes pass the Great Lakes and N. Atlantic coast. At some ports lights are used at night—a red light for easterly winds, and a white above a red for westerly. On European coasts the system of signals devised by Fitzroy is used, with some modifications. It consists of a large cylinder and cone which can be suspended, and which will appear the same from whatever point viewed. The cylinder indicates the storm and is below; the cone, the direction of the wind, pointing upward for a N. direction (from NW. through N. to SE.); pointing downward, the opposite. The cylinder is now discontinued in Great Britain. At night lanterns are hung at each angle of the cone and (to represent the cylinder) at the four angles of a square.

Weav'er Birds, a family of finchlike birds peculiar to Africa and parts of S. Asia. They are named for their remarkable woven nests, which are constructed so as to protect the eggs and young from snakes and monkeys. Some are huge, heavy, and massive, clustered together in large numbers, under a common roof, and bearing down the branches with their weight. Others are light, delicate, and airy, woven so thinly as to permit the breeze to pass through their netlike interior. Others, again, are so firmly built of flattened reeds and grass blades that they can be detached from their branches and subjected to very rough handling without losing their shape, while others are so curiously formed of stiff grass stalks that their exterior bristles with sharp points like the skin of a hedgehog. Many of the weaver birds are brightly marked. They feed on seeds and insects, especially beetles.

Weav′ing. See LOOM; TEXTILE FABRICS.

Weber (vā′bėr), **Karl Maria Friedrich Ernst von** (Baron), 1786–1826; German composer; b. Eutin, near Lübeck. His education was desultory, although his father wished to make him a musical prodigy. In 1800 he produced at Munich "Das Waldmädchen," an opera, and in 1801 "Peter Schmoll und seine Nachbarn," which met with slight success. In 1806 he entered the employment of Prince Eugene of Würtemberg, and produced at Carlsruhe, in Silesia, two symphonies and several less important works. He began a professional tour in 1810, conducted the opera at Prague, 1813–16, and was afterwards till his death manager of the German Opera at Dresden. In 1822 he produced at Berlin his principal opera, "Der Freischütz." In 1823 "Euryanthe" was first performed at Vienna, and in 1826 "Oberon" at Covent Garden, London. Weber took rank at the head of the romantic school. He possessed great harmonic invention and a vein of fresh and beautiful melody.

Web′ster, Daniel, 1782–1852; American statesman; b. Salisbury (now Franklin), N. H. He entered the Phillips Exeter Academy in 1796, and in 1801 graduated at Dartmouth College, foremost in his class. He finished his law studies at the office of Christopher Gore, in Boston, and was admitted to the bar in 1805. In 1806 he established himself at Portsmouth, then the capital of New Hampshire, where he rose at once to full practice. He took part in politics as a Federalist, and in 1812 was elected to Congress. He took his seat in the special session of May, 1813, and was on the Committee of Foreign Affairs. Early in the session he moved a series of resolutions on the repeal of the Berlin and Milan decrees, and on June 10th delivered his maiden speech, which took the House and the country by surprise. He was reëlected in 1814, and in 1815 supported the charter of the Bank of the U. S., which passed the House in April, 1816. His most important service at this session was the introduction of a successful resolution requiring all payments to the Treasury after February 20, 1817, to be made in specie or its equivalent, which restored the depreciated currency of the country.

In December, 1813, Webster's house at Portsmouth was burned, and at the close of his congressional term, in 1816, he removed to Boston. On March 10, 1818, his argument in the Dartmouth College case not only called to himself the admiration of the whole people, but secured one of the most important decisions ever rendered by the Supreme Court. It has been estimated that gifts to educational and other beneficent institutions amounting to more than $500,000,000 have been protected from legislative interference by the decision thus secured. In 1820 he was a member of the Massachusetts convention to revise the constitution after the separation of Maine. On December 22, 1820, he pronounced a discourse on the anniversary of the landing of the Pilgrim Fathers. In 1822 and 1824 he was elected to Congress from Boston. As chairman of the Judiciary Committee he carried through a complete revision of the criminal law of the U. S. In 1827 he was elected by the Legislature of Massachusetts to the Senate of the U. S. to fill a vacancy, and he retained his seat by reëlection till 1841. The first session of the Twenty-first Congress was signalized by the debate on Foote's resolution relative to the survey of the public lands, which gradually assumed the character of partisan warfare, and mainly related to the newly promulgated doctrines of the school of Calhoun on the right of a state to nullify an act of Congress.

Two speeches were made by Webster in reply to Hayne, of S. Carolina, of which the second, pronounced on January 26 and 27, 1830, is the most celebrated of his parliamentary efforts. From this time to the accession of Harrison to the presidency, in 1841, Webster took a foremost part in the debates on all the principal topics, sharing with Henry Clay the lead of the Whig party in the contest with nullification, and subsequently with Pres. Jackson. In 1839 he made a hasty tour in England, Scotland, and France, and on his return yielded the most efficient aid in bringing about the great political change which was consummated in the election of Gen. Harrison, in whose Cabinet he accepted the Department of State. Harrison's death and the succession of Tyler menaced the harmony of the administration, and finally overturned it; but Webster retained his seat in the Cabinet when the other members resigned, and completed the negotiation of the Ashburton Treaty with Great Britain, which settled the NE. boundary question and other matters in dispute. He retired to private life in 1843. At the first session of the Twenty-ninth Congress (December, 1845) Mr. Webster again took his seat in the Senate as the successor of Mr. Choate. He opposed the annexation of Texas as unconstitutional, but he thought it his duty, after the war with Mexico was actually commenced, not to withhold the supplies for the army.

After the election to the presidency of Gen. Taylor the controversies relative to slavery became violent. A national crisis seemed to be impending. In the senatorial debates on these subjects Webster delivered his much-criticised speech of March 7, 1850, in which he abandoned the Wilmot proviso and justified the Fugitive Slave Law. In the reorganization of the Cabinet by Pres. Fillmore after the death of Taylor, in 1850, Webster was called to the Department of State. In January, 1852, he argued the important India-rubber patent cause at Trenton. This was his last great forensic effort. His friends expected his nomination to the presidency at the Whig convention of that year, as they had upon several previous occasions, but the choice fell upon Gen. Scott. Early in May Mr. Webster was seriously injured by being thrown from his carriage near his farm in Marshfield, where he spent the closing months of his life.

Webster, John, English dramatist; b. in England toward the close of the sixteenth century; was associated with many dramatists, and ultimately became an author on his own account. Of his personal history nothing is known. Among his dramas are "The White Devil, or Vittoria Corombona"; "The Duchess of Malfy," "Appius and Virginia," and "The Devil's Law Case." Webster's genius was exclusively tragic; his diction is sometimes Shakespearean, but he exaggerated the terrible into the horrible, and the morbid gloom and ferocity of his pictures of life are unrelieved by Shakespeare's sweetness, or by any humor.

Webster, Noah, 1758–1843; American lexicographer; b. W. Hartford, Conn.; graduated at Yale, 1778, serving in the Continental army during a part of his college course; admitted to the bar, 1781; taught a classical school at Goshen, Orange Co., N. Y., 1782–83; prepared there his spelling book, grammar, and reader, printed under the title "A Grammatical Institute of the English Language, etc., in Three Parts"—a work so successful that the sale of the spelling book has exceeded 60,000,000; wrote political articles for the Hartford *Courant*, 1784; published "Sketches of American Policy," advocating the formation of a Federal constitution; traveled in the S. states to petition their legislatures to favor a copyright law; delivered lectures on the English language in the principal Atlantic cities, 1786; taught an academy in Philadelphia, 1787, and issued "An Examination of the Leading Principles of the Federal Constitution"; edited in New York, December, 1787, to November, 1788, the *American Magazine*, an unsuccessful enterprise; practiced law at Hartford, 1789–93; returned to New York and founded a daily paper, the *Minerva*; settled in New Haven, 1798; published "A Brief History of Epidemics," "Rights of Neutral Nations in Time of War," 1802; a "Compendious Dictionary of the English Language," 1806; and a "Philosophical and Practical Grammar of the English Language," 1807; devoted himself thenceforth to the great labor of his life, the "American Dictionary of the English Language"; was influential in the establishment of Amherst College; and completed his dictionary by the aid of the Libraries of the Univ. of Cambridge, and devoted his leisure for the remainder of his life to the revision of that work and of his schoolbooks.

Webster-Ash'burton Trea'ty. In 1839 Maine and Canada both laid claim to a large territory, and each insisted that under a former treaty, signed at the close of the Revolution, she was the rightful owner. Maine ordered troops into the disputed territory and held it, and this armed possession was known as the "Aroostook War." War was prevented and negotiations for settlement were undertaken. In 1842 Lord Ashburton came to America authorized to treat, and he and Webster agreed on a treaty, which was signed at Washington, and which compromised this dispute and set at rest all controversies concerning the N. boundary of the U. S., even as far W. as the Lake of the Woods. It also provided for the extradition of certain classes of criminals and for keeping armed cruisers of both nations employed in checking the slave trade.

Wedg'wood, Josiah, 1730–95; English potter; commenced business at Burslem, 1759, and brought himself into notice by the production of a cream-colored ware known as "queensware"; also fine black "basalts" or "Egyptian" ware, and a noted jasper ware. He made fifty copies of the Portland vase, introduced original and beautiful designs, raised British pottery to a fine art, and built the village of Etruria for his factories. He cultivated natural philosophy, invented the pyrometer, and contributed papers to the "Transactions" of the Royal Society.

Wed'lock. See MARRIAGE.

Wednes'day, the fourth day of the week; so named in consequence of an identification of the N. god Woden or Odin with the Roman Mercurius. By the old superstition Wednesday was considered not particularly lucky nor particularly dangerous.

Weeds, plants objected to because, growing at the wrong time and in the wrong place, they are injurious to the growth of crops or other valuable plants. Many, such as the dandelion and plantain, have broad, spreading leaves, which, by shutting off the sunlight, smother the tender young plants of lawn or pasture; others are feeding and breeding grounds for insects, thus assisting in the spread of crop diseases; some are poisonous to stock, tainting the milk or destroying wool; nearly all take from the soil large quantities of food and moisture necessary to the growth of more desirable plants.

Weeds constitute a hardy growth and are difficult to overcome. Annuals, such as wild mustard, shepherd's purse, and wild oats, produce in one season large numbers of seeds, which are disseminated through the agency of the wind, birds, animals, and man, and, though ready to sprout the following season, are so protected by oily or hard coats that they are able to sprout after lying in plowed-under ground even for many years. These plants must be cut down before seeds are formed to reproduce them. Biennials, usually tap rooted, represented by the wild carrot, burdock, and mullein, do not form seed until the second season. Such are destroyed only by continued cutting off of the top, or, better, removal of the root. Most difficult to overcome are perennials like the oxeye daisy, plantain and dandelion, some of which, notably the milkweed and bindweed, spread by creeping in their roots.

Week, a period of seven days, forming a subdivision of the lunar month, corresponding to the four quarters of the moon, or about 7⅜ days.

It was in common use among the ancient Hebrews, who in Exodus xx, 11, referred its origin to the creation of the world, and in Deuteronomy v, 15, to the exodus from Egypt. But it was not a Hebrew invention. It was found as a civil institution in the very earliest times among the Hindus, Persians, Assyrians, and Egyptians, though the Jews were the only nation with which the week had a religious signification. With the Egyptians, Assyrians, etc., the seventh day was simply a day of recreation; with the Jews it was the day of worship, the Sabbath The Greeks divided the month into three periods of ten days (decades), and the Romans gathered the days into periods of eight days (nundinæ); with both, the first day of the period was the market day, on which country people came to town and stirred up both business and public life. The period of seven days, the week proper, was introduced to the Romans and Greeks partly by Christianity (which may be inferred from the fact that the term *sabbath* was adopted), partly by the Egyptian astronomy and astrology. Among the Jews the days of the week had no names; they were simply counted. The Egyptians, however, named them after the seven planets then known and in the following way: they arranged the planets according to their distance from the earth, beginning with the most distant; ascribed a planet to each hour, and named the day after the planet which reigned over its first hour. This method of appellation was adopted by the Romans, so that when Saturn presided over the first hour of the first day, which consequently became Saturday, the first hour of the second day would fall to the sun, etc. Among Mohammedans, Friday is the special day for worship.

Weeks, Feast of. See PENTECOST.

Weep'ing, the shedding of tears, accompanied, especially in children, by facial distortion and involuntary muscular contractions. To secrete and conduct the tears there is a special apparatus within the orbit of the eye at its upper part, consisting of the lachrymal or tear gland; of a reservoir, the lachrymal sac; of canals which collect the tears and convey them to the lachrymal sac; and of a tube, the lachrymal duct, by which the secretion is carried into the nose. Tears serve to lubricate and keep moist the lining membrane of the eyelids and external coat of the eyeball. The secretion of tears, whether for emotional or physiological purposes, is effected through the fifth pair of the cranial nerves and the sympathetic nerves.

Sobbing, a species of weeping, results in part from the attempt to restrain the emotions and from a cause similar to that which induces sighing—the demand of the system for additional aëration of the blood—a process which intense emotion serves to disturb.

Wee'vil, a beetle about ⅛ in. long, of chestnut-brown color, with the head drawn out into a snout, at the top of which are the jaws. There are over 400 N. American species, the most important being the grain weevil, a destructive pest to stored grain. Several generations are produced each year. The remedies used against weevils are principally kiln drying, sulphur fumes, and sprinkling of air-slaked lime among the grain. The best antidote is cleanliness. All rubbish that can harbor weevils should be burned, cracks filled up, the walls whitewashed, and a general supervision had over the grain, which should be kept as cool as possible, and well aired.

a, Calandra granaria; b, C. oryzæ. (The small outlines show the natural size.)

Weigh'ing Machines', contrivances used to ascertain the heaviness of bodies.

Weight is the result of the attraction of gravitation upon a body, and as the force of gravity is not the same at different parts of the earth's surface, so the weight or effect of gravity of any piece or body differs according to the place at which it is weighed. Thus, a mass of iron which weighs 1,000 lb. at the equator would weigh 1,005 lb. at the pole; 500 lb. at a point 2,000 m. below the surface or 1,650 m. above it; 2,600 lb. on the surface of Jupiter, and 28,000 lb. on the surface of the sun. As ordinarily used, however, weight does not mean the absolute heaviness of a body or the effect of gravity upon it, but the relative heaviness as compared with that of a certain piece of metal which is taken as a standard, and weighed at the same place and under the same conditions. See WEIGHTS AND MEASURES.

The use of the elasticity of metal or other substances as the principle of a weighing machine is shown in Fig. 1, consisting of a flexible steel strip, *a*, fastened at one end to a pedestal, *b*, and carrying at its outer end a pan, *c*. A 1-lb. weight placed in the pan, *c*, will bring the pointer down to the mark 1 on the graduated standard, 2 lb. brings it down to the mark 2, and so on. By finely graduating the index plate, a fairly accurate weighing machine for a limited range of purposes is obtained. The ordinary spring balance consists of a spirally wound wire which is held at one end, the weight to be weighed being suspended from a hook at the other. The common form of bal-

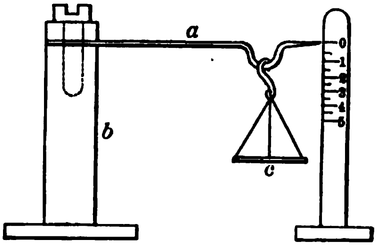


FIG. 1.—ELEMENTARY WEIGHING DEVICE.

ance with a pointer rotating on a dial is just the same with the addition of a small rack and pinion to give the rotary motion.

The hydrometer used for determining the density of liquids (Fig. 2) illustrates the principle of the buoyancy of liquids applied to determine the weight of small bodies, since equal weights placed in the pan at the top depress the instrument the same distance.

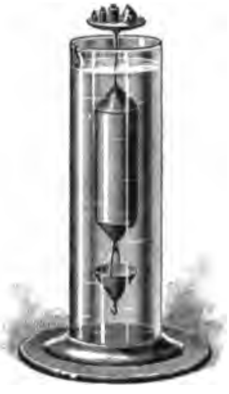


Fig. 2.—Hydrometer.

The pendulum or bent-lever balance is a balance, the most common form of which is a cheap and not very accurate letter balance, for weighing a few ounces. It consists of a bent arm, *a* (Fig. 3), carrying at the end of the vertical portion a weight, *c*, and at the end of the horizontal portion the scale pan, *d*, suspended from a pivot, *b*. As weights are placed in the scale pan they will cause the weight, *c*, to move outward from the supporting pillar until the leverage of the arm and weight on one side of the pillar counterbalance the effect of the weight in the scale pan.

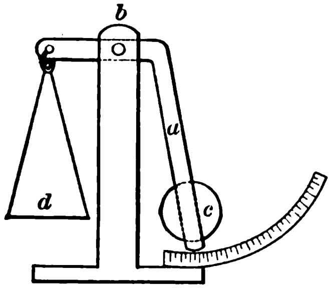


Fig. 3.—Bent-lever Balance.

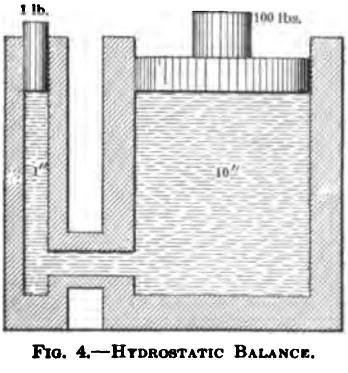


Fig. 4.—Hydrostatic Balance.

The hydrostatic balance (Fig. 4) is based on the principle of the hydrostatic press or jack. There are two communicating cylinders, one very much larger than the other, each fitted with a piston. Leakage and friction being left out of the account, a weight placed on the piston of the smaller cylinder will balance a weight on the piston of the larger cylinder which is as many times greater as the area of the larger piston is greater than that of the smaller. By substituting for the pistons flexible metallic diaphragms, the objections of leakage and piston friction are avoided.

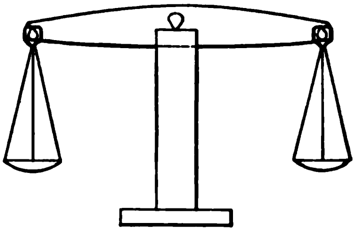


Fig. 5.—Even Balance.

The even balance is the simplest and most universally used weighing machine (Fig. 5). It consists of a rigid beam of metal, with three pivots, or "knife edges," inserted in it, so that their edges are in the same plane, and the end pivots equally distant from the central pivot. The central knife edge rests on a horizontal plate fastened in the upright support, and a hanger rests on each of the end knife edges, carrying the weighing pans beneath. (See Balance.) The pivots and central plate, and also the portions of the hangers which rest on the end pivot, are usually made of steel, but in fine chemical balances agate knife edges and plates are used. The even balance has one objection for heavy weights, *viz.*, the necessity of placing weights in one pan of the balance equal to the weight of the substance which is being weighed in the other. This led to the adoption of the lever balance, or Roman steelyard. (Fig. 6.) Its principle is based on that of the lever, namely, that a heavy weight suspended from the end of the short arm of the lever may be balanced by a smaller weight suspended from the end of the long arm, the weights being inversely proportional to the lengths of the arms. In practice the steelyard balance does not generally have a pan support or weight holder attached to each end of the balance, but only to the short end, while on the long arm there is a movable weight, which may be placed at any position required

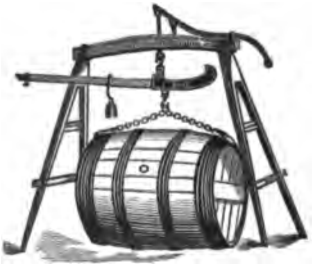


Fig. 6.—Weighmaster's Steelyard Scale.

to balance the weight suspended from the short arm. Marks and nicks are placed upon the beam to indicate the positions at which the movable weight should be placed.

The compound-lever balance is merely an improvement of the steelyard, by using two or more steelyards linked together. (Fig. 7.) If 100 lb. is suspended from the short arm of a beam whose arms are to each other as 10 to 1, a force of 10 lb. applied at the end of the long arm will balance it, but this force may be applied by means of a second lever. If this second lever also has a ratio of lengths of arms of 10 to 1, 1 lb. applied at the end of the long arm of the second lever will balance 100 lb. at the end of the short arm of the first lever, the weights of the levers, of course, being first counterbalanced so as to remain in balance when unloaded. The Boston market scale (Fig. 8) works on the compound-lever principle.

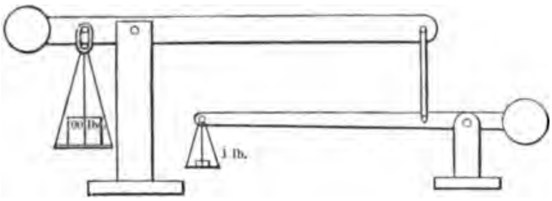


Fig. 7.—Compound-lever Balance.

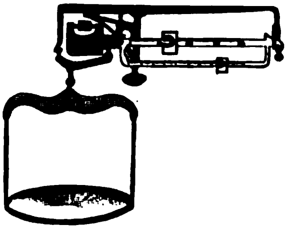


Fig. 8.—Boston Market Scale.

For many purposes suspended scale pans are inconvenient, and pans supported above the beam are desired. In order to make a successful upright-pan balance it is necessary to allow the pan supports to move on the ends of pivots and at the same time to insure that they remain in a vertical position, by securing a parallel motion (Fig. 9), by placing a second beam underneath the first. In ordinary knife-edge upright-pan scales (Fig. 10), like the grocer's counter scale, the lower beam is hidden in the casting, close to the table.

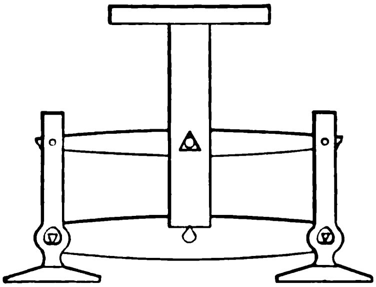


Fig. 9.—Model of Upright-pan Scale.

To obtain an idea of the platform scale, invented in 1831 by Thaddeus Fairbanks of Vermont, refer to Fig. 7, and imagine four equal steelyard levers like the one at the left of the cut, which carries 100 lb., so disposed at the corners of a rectangle that the ends of their longer arms nearly touch each other, and a double hanger extending from the pivots at these ends downward to the central pivot of the lever shown at the right of the cut. The relative lengths of all the levers remaining as before, 10 to 1, it is evident that 4 lb. placed in the small pan of the lower level will balance 400 lb.—that is, 100 lb. on each of the four primary levers. Now substitute for the 400 lb. and the pans a rectangular platform placed above the four levers, and provided with four short feet which rest in the links hanging on the pivots of the short arms of the four levers, and load this platform so that the total load including the platform equals the weight of the pans and 400 lb.; it is then evident that the machine thus constructed will be in equilibrium when 4 lb. are in the pan at the extremity of the lower lever. The upward force of 4 lb. acting at the outer pivot, instead of being thus counterbalanced, may be carried by a system of levers and links to any point at which it may be more convenient to counterbalance it by a weight in a pan, or by a weight sliding on a graduated beam.

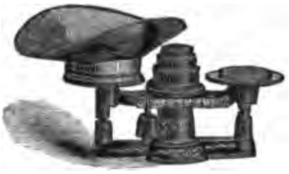


Fig. 10.—Even Balance with Side Beam.

In the torsion balance a twisting wire is used for a pivot, and these scales show great durability and sensitiveness.

Weight. See Gravity; Weighing Machines; Weights and Measures.

Weights and Meas'ures, instrumental means employed for the exact determination of quantity. It has been a part of the public policy of every organized community to regulate such systems by law, defining the units which shall be used, with their multiples and submultiples, and providing carefully constructed standards to which the measures in actual use must conform.

The word pound is the Roman *pondus*, a "weight," and the unit it originally represented was doubtless arbitrary. The foot, as a measure of length, made its first appearance in Greece. The Romans employed the step as a measure of distance, and when the distances required a larger unit, they used the *mille passuum*, 1,000 paces, from which has been derived the mile. The foot is a unit of comparatively modern origin, as the Egyptians, the Assyrians, and the Babylonians, with whom the Israelites were contemporaneous, used the cubit, or length of the fore arm, as the unit of linear measure. With the Israelites, all the subdivisions of this unit purported to be dimensions of the person. The cubit contained two spans; the span, three palms; the palm, four digits.

Other measures derived from the person, of which the origin or date is unknown, are the ell (*ulna*), derived from the fore arm; the Italian *braccio*, the Portuguese *braça*, the Swiss *brache*, and the Spanish *braza*, all signifying the length of the arm; the English yard, from old English *gyrdan*, to "gird," the girdle or measure of the body's circumference; the English fathom, also from old English *fæom*, embrace, the length of two arms; to which may be added the hand, and perhaps the nail, in England, the *pouce*, or thumb's breadth, in France.

Measures of capacity may have been derived from the content of some natural vessel, as a gourd or the shell of a cocoanut. The *homer*, as a measure of dry capacity among the same people, signified a heap, and the *gomer*, a diminutive of this, and the hundredth part of a *homer*, signified a heap also. These names indicate that the vague estimate of quantity must have been made by the eye alone.

Of measures of length there are at present among us one unit for carpentry and mechanics, the foot; another for textile fabrics, the yard; another for field surveying, the chain; and another for road measure, the mile. The foot is subdivided to inches and lines; the yard, to quarters and nails; the chain, to links and decimals; and the mile, to furlongs and rods. The superficial measures, which are the squares of these units, are equally diverse, with the addition of the country dimension of the acre. Of capacity measures there are, for liquids, the gallon, quart, pint, and gill; for cereals and other dry substances, the bushel and peck; and for firewood, the cord. Of weights there are, for ordinary commerce, the avoirdupois pound, with its subdivisions, and for large masses its irregular multiples of the quarter, hundred, and ton; for bullion, plate, and coin, the pound troy, irregularly subdivided; for drugs and medicines, the apothecaries' pound, equal to the troy pound, but differently subdivided; and for gems, the carat. This multiplication of systems, which is wholly unnecessary, has added much to the difficulty of dealing with problems relating to quantity.

The earliest legislation of Great Britain on weights and measures is in the reaffirmation of the Great Charter under Henry III (1225 A.D.), which simply declares that they shall be uniform throughout the realm. A statute of 1226 (51 Henry III) founded measures of weight upon numbers of wheat corns, but the units of commercial weight were also units of coin weight. The pound thus determined, known as the tower pound, or the sterling or easterling pound, continued down to 1496, when it was superseded by the troy pound (12 Henry VII). The earliest statute in which the troy pound is mentioned is one of 1414 (2 Henry V), to regulate the charges of goldsmiths. In 1496, however, it was by statute of 12 Henry VII substituted for the sterling pound for the regulation of measures of capacity, the sterling pound continuing to be used at the mint; but by a subsequent statute of 1527 (18 Henry VIII), this last was definitely abolished.

The earliest British legislation as to measures of length is of date 1324 (17 Edward II), and provides that the inch shall have the length of three barleycorns, round and dry, laid end to end; that 12 in. shall make a foot, and 3 ft. a yard.

A statute which went into effect January 1, 1826, enacted that a standard yard be adopted and from this all other measures of extension be derived. In regard to weights, it declared a brass 1-lb. weight made in the year 1758, then in the custody of the clerk of the House of Commons, to be authentic, and named it the "imperial standard troy pound." It further declared that the said standard pound should contain 12 oz. of 20 pennyweights, each pennyweight containing 24 grains, "so that 5,760 such grains shall be a troy pound; and that 7,000 such grains shall be, and are hereby declared to be, a pound avoirdupois." As to measures of capacity, it was enacted that the standard measure, whether for liquids or for dry goods, should be the gallon, containing, at 62° F., with the barometer at 30 in., 10 lb. avoirdupois weight of distilled water. It is further declared that the standard gallon is equal in bulk to 277.274 cu. in. at 62° F.

Early in the colonial history of the U. S. the British exchequer standards of weights and measures had been legalized by many of the colonial legislatures. In 1730 a set of brass and copper avoirdupois weights and measures was imported into Massachusetts from the British exchequer, and in 1765 the treasurer was required to procure a balance and a nest of troy weights. The failure of Congress to exercise the powers conferred by the Constitution made it necessary for the executive to procure standards for use in the collection of revenue, and other operations. A brass scale by Troughton, of London, was obtained by the U. S. Coast and Geodetic Survey in 1814. It was 82 in. in length, and a part of it (from the 27th to the 63d-in. line) was adopted as the unit of length. A platinum meter and kilogram were procured by Gallatin in 1821, and a copy of the English troy pound was brought from London, also by Gallatin, in 1827. The latter became, by act of Congress, 1828, the standard of mass for the mint of the U. S., and, although totally unfit for the purpose, it has since continued to be the legal standard for coinage purposes.

To encourage uniformity, the Secretary of the Treasury in 1836 caused a complete set of all standard weights and measures to be delivered to the governor of each state in the Union, thus furnishing material standards, the adoption of which would secure practical uniformity throughout the country. These standards were generally adopted by the state authorities, and the words *pound* and *yard* have come to have everywhere in the U. S. the same practical meaning.

The first and almost the only general legislation on the subject of weights and measures was the act of Congress of July 28, 1866, making the use of the metric system lawful throughout the U. S., and defining the weights and measures in common use in terms of the units of that system. In 1875 an international metric convention was agreed upon by the principal governments of the world, including the U. S., at which it was undertaken to establish and maintain at common expense a permanent international bureau of weights and measures, the first object of which should be the preparation of a new international standard meter and a new international standard kilogram, copies of which should be made for distribution among the contributing governments. On January 2, 1890, the meter and kilogram were adopted as the national prototype meter and kilogram. The pound and yard, which, by reason of their adoption by the Treasury Department, had become the customary units throughout the country, were based upon standards copied from those in use in England in the early nineteenth century. By the Treasury Department the yard is now defined as being $\frac{3600}{3937}$ of a meter, and the pound avoirdupois $\frac{1}{2.2046}$ of a kilogram, thus putting these standards in direct relation with those of other civilized nations, in all of which, with only one or two exceptions, the metric system is now in use. See METRIC SYSTEM.

Weights, Atom'ic. See CHEMISTRY.

Weimar (vī'mär), capital of the grand duchy of Saxe-Weimar; on the Ilm. It is a quiet, neat, pleasant, and aristocratic place, contains few imposing edifices, and has hardly any trade. In 1547 it became the residence of the Ernestinian line (the Albertinian line reigns in Dresden), and was conspicuous during the second classical period of German literature, when Wieland, Herder, Goethe, Schiller, and many lesser authors made famous the court of Karl August. The grand ducal castle, rebuilt in 1774 after the great fire, is rich in relics and memorials. Other places of interest are a park established by Karl August and Goethe, the library of 180,000 volumes, besides statues and portraits; the state archive, with rich historical treasures; the court theater; Goethe's house (1782–1832), now a Goethe museum; Schiller's humble residence (1802–5); the permanent exposition of art and art industry, containing also a Japanese museum—all these make the "German Athens" a literary center. Here Schiller and Goethe are buried. Beautiful statues adorn the city and the environs, where are the castles of Belvedere, Tiefurt, Ettersburg, and Ossmanstedt with Wieland's grave. Pop. (1905) 31,117.

Weir, Harrison William, 1824–1906; English artist; b. at Lewes; was apprenticed to a wood engraver at London; gave great attention to natural history and studied water-color painting; was one of the original members of the Society of Painters in Water Colors; became noted for his wood engravings of animals and by his illustrations to several books on natural history.

Weir, Robert Walter, 1803–89; American painter; b. at New Rochelle, N. Y.; pupil of Jarvis; began to paint portraits in 1821; went to Florence in 1824 and studied with Benvenuti; National Academician, 1829; Professor of Drawing at the U. S. Military Academy, 1837–79. His "Embarkation of the Pilgrims" is in the Capitol at Washington, D. C.

Weismann (vīs'män), **August,** 1834– ; German naturalist; b. Frankfort-on-the-Main, Germany; studied medicine at Göttingen, and was physician to the Archduke of Austria; then turned to zoölogy, and for many years has been professor in the Univ. of Freiburg. His first researches were on the development of insects. His writings have been the greatest stimulation to research of any since the publication of Darwin's "Origin of Species." Among his works are "Studies in the Theory of Descent," "Essays on Heredity," and "Germ Plasm." See HEREDITY.

Weld'ing, a property of iron, platinum, and some other metals by which they unite when heated and brought together. Ordinarily the metals to be welded are raised to a white heat, sprinkled with a flux to prevent the surfaces from absorbing oxygen, and then hammered together. A current of electricity is now often used to heat the metals. See ELECTRIC WELDING.

Wel'land Canal', a canal connecting Lakes Ontario and Erie on the Canadian side of the Niagara River. It was constructed in 1833 and enlarged in 1871, the present length being 26¾ m.; number of lift locks, 25; total rise of lockage, 327 ft.; size of locks, 270 by 45 ft.; width of canal, 100 ft.; depth on sills, 14 ft. The total cost up to 1909 was $28,338,616. In 1908 the amount of freight passing through the canal was 1,703,453 tons. It is open on an average for 241 days in the year.

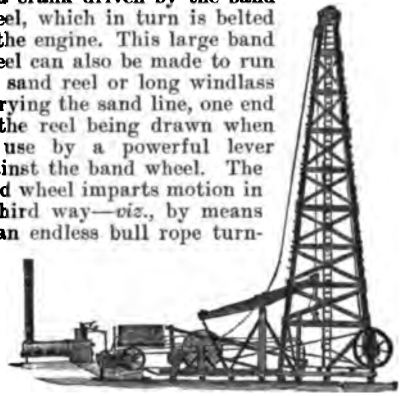
Well Drill'ing, or **Well Bor'ing,** the operations by which deep holes of small diameter are sunk to obtain water, petroleum, gas, coal, iron ore, salt, and other minerals. The principal feature of well drilling or boring is that all of the operations are conducted from the surface, the hole being generally from 3 to 6 in. in diameter. Two methods of well sinking are commonly included under the terms well drilling and well boring—*viz.*, the grinding with pressure, by which a hole is made, and the grinding or shattering of the rocks by a heavy, chisel-pointed bar. The two methods and the machinery adapted to their application are represented in their highest development on the one hand by the diamond drill (see BLASTING), and on the other by the rope drill or ordinary oil-well apparatus. The first cuts or bores a hole, either cylindrical or ring-shaped, and in any direction; the other pounds and shatters a hole by its own weight, descending vertically. The diamond drill will penetrate any rock hard enough to stay in place, while the percussion drill, more simple in construction and operation, is cheaper, requires labor less skilled, and rapidly pierces the softer rocks.

The pounding or percussion drill is in common use for sinking deep wells, either for fresh water, brine, petroleum, or gas, while the diamond drill is of greatest utility in exploring the harder rocks for coal, iron ore, and the precious metals. An iron bar tipped with steel drawn to a blunt cutting edge, if repeatedly raised a few inches and dropped upon a rock, cuts a depression. By slightly turning the bar each time it is raised and causing the chisel edge to strike across the mark left by the preceding blow the depression becomes a nearly circular hole. If the bar is repeatedly raised, turned, and let fall the hole deepens until the powdered rock prevents further progress. If water is now put into the hole the rock dust becomes soft mud, and can be drawn out. To make a deep well the same principle is employed; the tools are made larger, heavier, and longer, and are generally suspended from ropes.

The first step in the development of deep-drilling machinery from the simple bar is the use of a spring pole to raise the drill. A small tree of suitable elasticity is cut and trimmed into a long pole, the butt firmly fastened to the ground and the top inclined upward at an angle of about 30° to the horizon. From the tip the drilling rod is suspended. By pulling the end of the pole down the drill strikes its blow and then is lifted by the tendency of the pole to become straight again. In this way the labor is greatly reduced, since it is far easier to pull down the drilling rod than to lift it. Wells of from 2 to 3 in. in diameter and 100 ft. or even more in depth are drilled in this manner, two men working at a time and making a progress of about 15 ft. a day. The second degree of development is the use of horse power to raise the drill, suitable devices being employed, such that rotary motion from a treadmill or capstan is converted into a rapid vertical lift and fall. From this it is but a short step to the use of steam power, by which the largest results are accomplished. With horse power wells of from 3 to 4 in. in diameter are often drilled to depths of from 100 to 300 ft. or more, while with steam depths of 4,000 ft. are not rare. By far the greater number of deep wells are now drilled by steam, hand power and horses being used in putting down shallow wells in localities where machinery is expensive and labor cheap.

Wells, ranging generally from 1,000 to 2,000 ft. in depth, are being drilled in the U. S. at the rate of about 300 a month. These are mainly in the oil and gas regions of Pennsylvania, Ohio, and Indiana. The machinery in common use has been perfected in these oil fields, where certain standard sizes and patterns have been adopted after years of trial and change, and a description of the apparatus employed in drilling an oil well applies to the machinery used for probably nine tenths of the other deep wells of the U. S.

The most prominent object about a deep-drilling well is the derrick or rig, a framework tower 20 ft. square at the bottom, tapering to 4 ft. at the top, and usually 72 ft. high. This tower carries two pulleys, the crown pulley in the center and the block through which the sand line runs. Over the crown pulley runs the cable by which the drilling tools are suspended and raised or lowered, while the sand line is a smaller rope used to draw out the sand pump or bailer, by which the hole is cleaned. At one side of the rig are the bull wheels or windlass upon which the cable is wound, and at the other the walking beam, a heavy timber 20 ft. long hung in the center so that it can oscillate up and down. One end comes directly over the hole, and the other can be attached by a pitman to a crank driven by the band wheel, which in turn is belted to the engine. This large band wheel can also be made to run the sand reel or long windlass carrying the sand line, one end of the reel being drawn when in use by a powerful lever against the band wheel. The band wheel imparts motion in a third way—*viz.*, by means of an endless bull rope turning the bull wheels which wind or unwind the cable. Without moving from his position on the floor of the derrick, the driller can start, stop, or reverse his engine, run the sand line or cable in or out of the hole, or control the motion of the walking beam and perform all the operations of putting the drilling tools in or out, cleaning the hole, and drilling. In Canada and a few localities in the U. S. drilling is done by means of wooden rods instead of a rope.



MACHINERY AND DERRICK USED IN WELL DRILLING. On the extreme left is the boiler for generating steam, and next to it is the engine above which is a wooden tank for holding water for the boiler. To the right of this, and in the center of the picture is the band wheel and diagonally above this the walking beam. In the lower part of the derrick and at the extreme right are the bull wheels.

It is necessary that at least the upper part of the well, where the rocks are soft, be lined with casing. This not only keeps the walls from falling in, but also, if properly set, keeps out surface or other waters. It is usual to drill the hole as rapidly as possible, and then slip the casing in, its diameter being less than that of the drill. Sometimes this cannot be done on account of the instability of the walls, and then it is necessary to adopt some modification, as, for instance, drilling ahead a short distance and then driving the casing down. The casing is usually wrought iron.

Welles (wĕlz), **Gideon**, 1802–78; American statesman; b. Glastonbury, Conn.; educated at Norwich Univ., Vt.; was editor and proprietor of the Hartford *Times*, a Democratic paper, 1826–36, and contributed to its editorial columns till 1854; supported Gen. Jackson for the presidency; member of the state legislature, 1827–35; state comptroller, 1835, 1842–43; 1846–49 chief of a bureau in the U. S. Navy Department. He was an original member of the Republican Party, and as chairman of the

Connecticut delegation at the Chicago convention was influential in securing the nomination of Lincoln; Secretary of the Navy through the administrations of Lincoln and Johnson, and through his energy the strength and efficiency of the navy were greatly increased, though at such great expense as to provoke criticism. He was identified with important reform movements, notably for the abolition of imprisonment for debt, and was pronounced in his antislavery views.

Wellesley (wĕlz′lĭ), **Arthur.** See Wellington.

Wellesley College, an institution of learning devoted exclusively to the higher education of women; in the village of Wellesley, on Lake Waban, about 15 m. from Boston. The grounds comprise 300 acres. The college is chartered by the state, and empowered to confer all collegiate and honorary degrees that are conferred by any Massachusetts college or university. There were in 1909 1,319 students and 103 instructors.

Wel′lington, Arthur Wellesley (Duke of), 1769–1852; British general and statesman. He was educated at Eton, at Brighton, and at the Military College of Angers. In 1787 he received a commission as ensign in the Seventy-third Foot, and after a rapid series of changes and promotions, attained by purchase in 1793 the command as lieutenant colonel of the Thirty-third Regiment. During 1794 and 1795 he served with his regiment under the Duke of York in Flanders. In 1796–99 he served with success in India. In 1802 he attained the rank of major general, and in the following year was appointed to the chief military and political command in the operations against the unruly Mahratta chiefs, whom he defeated at Assaye on September 23d, and at Argaum on November 29th. Early in 1805 Wellesley returned to England. In 1806 he succeeded Lord Cornwallis as colonel of his own regiment (the Thirty-third). On April 10, 1806, he married Lady Catherine Pakenham, third daughter of the Earl of Longford. He was shortly afterwards elected M. P. for Rye, and in April, 1807, was appointed Secretary of State for Ireland. In 1808 he attained the rank of lieutenant general, and in June received the command of a force destined to operate in the N. of Spain and Portugal. In 1809 Wellesley was appointed to take the chief command in the Peninsula, which had been overrun by the French. The famous passage of the Douro, and the defeat of Soult which followed, fittingly opened this masterly campaign. For the victory at Talvera (July 28th), the first of a long list that subsequently took place in the Peninsula, the government raised the commander in chief to the peerage as Viscount Wellington. Toward the end of 1810 Wellington fought the battle of Busaco, which was followed by the famous fortification and defence of the lines of Torres Vedras. A little later (in 1811) occurred the victory of Fuentes de Onoro. In the following year he took Ciudad Rodrigo and Badajoz by storm, and fought the battle of Salamanca, accounted one of his most famous victories. On August 12, 1812, Wellington entered Madrid. For his brilliant conduct of the campaign thus far he was raised to the dignity of marquis, and received £100,000. Next followed the battle of Vitoria (June 21, 1813), for which decisive victory Wellington was given the baton of field marshal; then battles in the Pyrenees, the capture of San Sebastian, and the crossing of the Bidassoa into France. In 1814 the battle of Orthez was gained, and in the same year the battle of Toulouse, in which Soult's best troops were routed and the hopes of France in the Peninsula utterly annihilated. In May the triumphant general was created Marquis of Douro and Duke of Wellington, with an annuity of £10,000, commuted afterwards for £400,000. In July he went as ambassador to France, and succeeded Lord Castlereagh as British representative in the Congress of Vienna. In April he took the command of the army assembled in the Netherlands to oppose Napoleon. (See Waterloo.) With the return of peace he resumed the career of politics. He was in the cabinet of Lord Liverpool in January, 1819. In 1822 he represented Great Britain in the Congress of Vienna. In 1826 he was appointed high constable of the Tower and in 1827 succeeded the Duke of York as commander in chief of the forces. In 1828 he accepted the premiership, resigning the command of the forces to Lord Hill. In 1829 he was appointed governor of Dover Castle and lord warden of the Cinque Ports. He accepted office under Sir Robert Peel in 1834–41, and again in 1846, when he helped to carry the repeal of the corn laws, which till then he had opposed. In 1842 he resumed the command of the forces.

Wellington, capital of New Zealand since 1865; on an inlet of Cook's Strait, on the W. shore of Port Nicholson. It is well built, has an excellent harbor, and is connected by railway with Auckland. The buildings include the Victoria University College, a branch of the New Zealand Institute, colonial museum, and government buildings. It has much trade, exporting wool, tallow, and gum. It was founded in 1840. Pop. (1906), with suburbs, 63,807.

Wellingto′nia gigan′tea. See Sequoia.

Wells, David Ames, 1828–98; American economist; b. Springfield, Mass.; graduated Williams College, 1847, and Lawrence Scientific School, Cambridge, 1851; assistant professor there, 1851–52; associated with Dr. A. A. Hayes as a chemist at Boston, 1853–55; patented in 1856 several improvements in bleaching; visited Europe on commissions of the U. S. Govt., 1862 and 1867; U. S. special commissioner of the revenue, 1866–70; university lecturer on political economy at Yale, 1872; visited Europe, 1873; had been since 1867 an advocate of free trade, and had taken considerable part in the efforts for civil-service reform. He edited, among other works, the "Annual of Scientific Discovery," sixteen volumes. He was a voluminous writer on financial and economic subjects.

Wells, Horace, 1815–48; American dentist; one of the claimants of the discovery of anæsthesia; b. Hartford, Vt. He practiced in Boston and Hartford. In 1840 the use of nitrous-oxide gas as an anæsthetic occurred to him. He successfully administered this gas in twelve or fifteen cases of extraction of teeth during 1844, and other dentists of Hartford also used it.

Wells. See Artesian Wells; Water; Well Drilling.

Welwitschia (wĕl-wĭch'ĭ-ă) **Mira'bilis,** a plant allied to the pines found in W. Africa; is never above a foot high, though its trunk is sometimes 6 ft. in diameter; is found only in an elevated rainless, stony plateau; attains an estimated age of above a century; produces flower stalks 12 in. high, cones 2 in. long, and two flat leaves 6 ft. long, which lie upon the ground.

Wen, a tumor upon the surface of the body, especially on the scalp. It originates by the closing of a follicle of the skin, and the slow accumulation of sebaceous matter. The wen is a harmless, nonmalignant tumor, and its removal is easy and harmless.

Went'worth, Thomas. See Strafford, Earl of.

Weser (vā'zẽr), river of Europe formed by the Fulda and the Werra, at Münden, Hanover, whence it flows N., and enters the North Sea after a course of 250 m. It is navigable for small craft to Münden, for vessels of considerable size to Bremen, but ships of the largest size ascend no farther than Bremerhaven, which is at its mouth. This river is not of consequence for traffic, though it communicates with the Elbe by canal.

Wes'ley, or **West'ley,** a noted family of divines. Samuel, English clergyman; b. 1662, 1666, or 1668; d. 1735; the son of a dissenting minister, but early joined the Church of England, and for thirty-three years was rector of Epworth, Lincolnshire; wrote several poems, mostly religious, a Latin commentary on the book of Job, and a "Treatise on the Sacrament." Samuel, son of the preceding; b. 1690 or 1692, d. 1739. He took orders, but passed his life as a schoolmaster. He viewed the "new faith" and conduct of his brother, John and Charles, with disapprobation. A collection of his poems, containing some humorous pieces, appeared in 1736. John, 1703–91; founder of Methodism, brother of the preceding. He entered Christ Church College, Oxford, 1719; ordained deacon, 1725; graduated M. A., 1727, and became his father's curate at Wroote. He was ordained priest in 1728, and returned to Oxford, 1729, where he remained as tutor in Lincoln College till 1735, becoming the leader of a band of young men, including his brother Charles, who were seeking a deeper religious experience. At the solicitation of Gov. Oglethorpe, in 1735 he undertook a mission to the colony of Georgia, one of his objects being the conversion of the Indians. During the voyage he made the acquaintance of some Moravian missionaries, and on returning to England in 1738 he sought the society of the Moravians. He began to examine their teachings, and received aid from Peter Böhler, one of the missionaries then on their way from Herrnhut to Georgia. He visited Herrnhut, the center of Moravian operations, where he listened to Christian David, and had conversations with Zinzendorf. He returned to England, and preached in churches, prisons, and almshouses. In 1739 Wesley joined Whitefield at Bristol, and began to preach to multitudes. On May 12th he laid in Bristol the corner stone of the first Methodist chapel, and in November opened the foundery chapel in Moorfields, London, which became the headquarters of the Methodist movement. In 1740 he published a sermon on "Free Grace," in which he opposed the doctrine of election and predestination. The result was the temporary alienation of Whitefield and Wesley, and the organization of the Lady Huntingdon Methodists and the Calvinistic Methodists in Wales.

From this time there were two movements: the Calvinistic, led by George Whitefield, and the Arminian, by John Wesley. Wesley's journeys soon extended into Scotland, Wales, and Ireland. He formed societies, employed lay preachers, appointed class leaders, devised an effective system of church finance, wrote and published books and tracts, and established schools. The first Methodist Conference was assembled in the foundery chapel, June 25, 1744. On the death of Whitefield in 1770, the Calvinistic controversy broke forth with violence. This was the occasion of some of Wesley's most vigorous writings, and brought to his aid the powerful pen of Fletcher. From this time each branch went its own way to do its own work. In 1770 preachers had been sent to America. On the establishment of the independence of the colonies, the Methodists in America called for the administration of the sacraments at the hands of their preachers. Since Wesley had for years been satisfied that the orders of bishop and presbyter in the primitive church were essentially the same, in 1784, with the assistance of others, he ordained Thomas Coke superintendent or bishop of the Methodist societies in America, and empowered him to confer the like office on Francis Asbury. During the last four years of his life his strength had continued to decline, yet not his energy or his labors. Charles, 1708–88; brother of the preceding. While at Christ Church College, Oxford, he became so serious, devout, and zealous that the wits called him and his companions "Methodists," a title which had been given derisively to rigidly religious persons a century before; went to Georgia with his brother John, but remained there only a short time; preached to large congregations at Blackheath, near London, and after the return of his brother entered upon the itinerant ministry, mostly in London and its vicinity. A volume of his sermons, his journal, and two volumes of his hymns have been published. He is "the poet of Methodism," having written over 6,000 hymns.

Wes'leyans, and **Wesleyans, Prim'itive.** See Methodism.

West, Benjamin, 1738–1820; American painter; b. Springfield, Chester Co., Pa. When a child he showed great disposition for art, and, although his parents were Quakers, he was allowed to follow his inclinations. He received some instruction from William Williams, an artist, of Philadelphia; then removed to Lancaster, Pa., where he attempted portraiture, and painted a "Death of Socrates." At eighteen he established himself as a portrait painter in Philadelphia, but in 1758 removed to New York, and in 1760 went to Rome. He painted several pictures there, including a "Cimon and Iphigenia" and an "Angelica and Medora." He went to England in 1763, and established himself in London. He painted several pictures for the Archbishop of York, and this brought him to the notice of George III, who made West his historical painter, and gave him commissions (1769–1801), including twenty-eight pictures illustrating the progress of revealed religion for the oratory at Windsor, many portraits of the royal family, and a "Death of Wolfe," in which the figures are clothed in the costume of the period, contrary to the practice of the classical school, then dominant. In 1768 he aided in founding the Royal Academy of painting, sculpture, and architecture, and in 1792 succeeded Sir Joshua Reynolds as its president. He retained this office almost uninterruptedly for twenty-three years. In 1802 he painted "Christ Healing of the Sick in the Temple," a copy of which is in the Pennsylvania Hospital in Philadelphia.

West'ern Austra'lia, originally the Swan River Settlement; the westernmost of the seven Australasian colonies, the first in area and last in population; comprising the whole of Australia W. of the meridian of 129° E., which separates it from S. Australia; area about 975,920 sq. m., or one third of the Australian continent. A large proportion is in heavy timber—sandalwood and eucalyptus. The coasts are estimated at 3,000 m., but good harbors are few. The habitable part is confined to the coast, along which the settled portion stretches for 1,200 m., and from which it extends inland for about 150 m., the interior being the Great Victorian Desert. The climate is salubrious, the average temperature at the capital being 64° F., and the rainfall 34 in. The extreme N. part of the colony, the Kimberley district, is tropical, rich in minerals, and the interior appears less arid. The rivers of the entire colony are short, and not suitable for navigation. Agriculture is restricted, owing chiefly to lack of labor. The live stock in 1906 consisted of 104,922 horses, 690,011 horned cattle, and 3,333,658 sheep; also many pigs, goats, and camels. It is estimated that in the N. there are 20,000,000 acres affording good grazing. Gold is worked in the N. and in the SW., and is found in other parts. The export of gold has greatly increased. There are also mines of silver, copper, lead, and tin, and the prospective mineral wealth is great. The chief export is wool; then come gold, pearls and pearl shell, timber and sandalwood, and skins. W. Australia became a British settlement in 1829. The legislative power rests in an elective Parliament of two houses, and the executive in a governor appointed by the British crown and assisted by a responsible ministry. It became a self-governing colony in 1890, and both houses became fully elective in 1893. The entire population in 1908 was estimated at 270,777. Perth, the capital, had (1907) pop. 50,527; Fremantle, its port, had (1907) pop. 18,945. See Australia.

Western Em'pire, a name sometimes applied to the W. provinces of the Roman Empire between the years 395 and 476. The term is misleading, for, while in this period there were two emperors, one of whom resided in Italy and had direct control over the W. provinces, the empire remained in theory one, and the acts of each emperor were binding through the whole empire. See Byzantine Empire.

Western Is'lands. See Azores; Hebrides.

Western Reserve' Univer'sity, an institution founded in Cleveland, Ohio, in 1884. This step was taken by the trustees of Adelbert College, and most of the trustees of the college are also trustees of the university. The object of the organization was to effect a confederation of several institutions either already existing or to be erected, under one general management and control. The university now embraces the following departments: Adelbert College; the college for women, organized in 1888; the college of medicine, formerly known as the Cleveland Medical College, organized in 1844; the college of dentistry, established in 1892; the graduate department, opened in 1892; the Western Reserve Academy, at Hudson, Ohio, preparatory and classical school, belonging to Adelbert College. All these departments have courses of study leading to degrees. The whole number of students in 1909 was 1,011.

West Ho'boken, town, Hudson Co., N. J.; 160 ft. above tidewater; 1½ m. W. of Hoboken ferry on the Hudson River, directly opposite New York. It has a monastery of the Passionist Fathers, convent of the Sisters of St. Dominic, Masonic Hall, and is principally engaged in the manufacture of silk goods. Pop. (1900) 23,094.

West In'dia Com'pany, Dutch, an association formed in the Netherlands in 1621 for the purpose of trading with America and Africa, establishing colonies, and fitting out privateers against the Spanish and Portuguese. The capital was eventually 18,000,000 florins. It was composed of a union of five chambers, representing respectively the cities of Amsterdam, Zeeland, Rotterdam, Groningen, and the district of the N.; these nominated nineteen directors, who formed the central body of administration. The company received from the state 200,000 florins yearly for five years, a monopoly of trade with Africa and America, the right of constructing forts, raising fleets and armies, and making treaties; troops were to be furnished by the state, but paid by the company; and in case of war the state agreed to lend a fleet. One of the first acts was to send a large fleet to Brazil, where Bahia was taken (1624), but soon abandoned; later, Pernambuco was seized, and became the center of extensive Dutch colonies in that part of Brazil. New Amsterdam (New York), already founded, was strengthened: powerful colonies were established in the W. Indies and Guiana, and for half a century the fleets of the company ravaged the shores of Spanish and Portuguese America, taking cities, destroying ships, and gathering an immense amount of booty. The continual wars with Spain, Portugal, and England eventually proved the ruin of the company. Brazil was given up in 1654, and New York in 1667. In 1674 the company was forced to dissolve. A new one was formed in 1675, and held together until 1791, but it was never very prosperous. Of all the conquests of the West India Company, the Netherlands now retain only Dutch Guiana, Curaçao, Saba, St. Martin, a few smaller islands in the W. Indies, and the fort of St. George at Elmina on the Gold Coast of Africa.

West In'dies, or Antilles (ăn-tĭl'lēz), an archipelago forming a curved chain from Florida and Yucatan to the N. coast of S. America, framing the Caribbean Sea on the N. and E., and separating it from the Gulf of Mexico and the Atlantic. The islands fall into four groups—Bahamas, Greater Antilles, Caribbean chain or Windward Islands, and Venezuelan or Leeward group. The Bahamas are clustered irregularly along a line beginning E. of Florida (separated by the Florida channel) and extending SE. almost to the coast of Santo Domingo. They include some twelve or fifteen larger and a multitude of smaller islands, generally connected by shallows or "banks." Some of them have hills of no great height, but portions of all are formed of shell and coral sand. The group is a reef formation gathered about a skeleton of older land. The Bahamas lie partly to the N. of the tropics, but the Gulf Stream sweeps through them, warming the air, so that the climate and productions are tropical. The name Greater Antilles is used to distinguish Cuba, Santo Domingo, Porto Rico, and Jamaica, the largest of the W. Indian islands; the group also includes some smaller islands—Mona, Isle of Pines, Tortuga, the Caymans, etc. They are different in character from the Bahamas, being formed in great part of mountain chains. In some places—especially in Santo Domingo—the mountains rise in precipices from the sea; elsewhere they slope back through verdant valleys to ranges 8,000 to 10,000 ft. high.

Two principal E. and W. chains may be traced—one running through Cuba and along the N. side of Santo Domingo, and the other on the S. side of Santo Domingo, reappearing in the Blue Mountains of Jamaica. The N. chain is on a line with the E. and W. Anahuac Range of Mexico, which embraces the highest peaks and nearly all the volcanoes of that country. Continued still farther W. the line strikes the volcanic Revillagigedo Islands in the Pacific; but the Greater Antilles contain no active nor recent volcanoes, though earthquakes are frequent. In Porto Rico the mountainous character is less marked, and E. of it the scattered group called the Virgin Islands is rocky and precipitous; it may be included either in the Greater Antilles or in the Caribbean chain. The latter (called also the Lesser Antilles or Windward Islands) departs abruptly from the E. and W. trend of the Greater Antilles, and belongs to a different mountain system. The islands are small but generally high—2,500 to 4,000 ft.—forming a regular, slightly curved N. and S. line on the E. side of the Caribbean Sea; nearly everyone contains an active or extinct volcano. The group is a chain of volcanic mountains, partially submerged, so that the islands are frequently separated by very deep channels. Barbados alone is outlying, to the E.; it is flat, and belongs to the fourth group, forming an E. and W. line off Venezuela. Its islands are properly outlying portions of the S. American continent. Trinidad and Tobago, as well as Barbados, are classed with the Caribbean group, but by their animals and plants, as well as by their physical characters, they are clearly S. American. The remaining islands—Margarita, Curaçao, Oruba, etc.—are called collectively the Leeward Islands, though this name is commonly applied to a British colony forming a portion of the Caribbean group.

Nearly all the W. Indian islands are fertile, abundantly watered, and well adapted for the culture of sugar cane, tobacco, coffee, and cacao, which form the staple products and exports. Beyond a little gold in the Greater Antilles, copper in Cuba, and asphalt in Trinidad, they have no mineral wealth, but their forests are rich in cabinet woods and drugs. The climate of all is essentially the same—tropical, but free from extreme heat even in the summer months, and generally salubrious except in a few coast towns where yellow fever is endemic. The warm and rainy season is from June to October, and this is the time of hurricanes. During the winter months the W. Indies are resorts for tourists and invalids.

Columbus, seeking a westward route to Asia, first saw the land of the New World in one of the Bahamas (October, 1492). Later, he discovered all of the Greater Antilles, and many of the smaller islands. As they were then supposed to be outlying portions of Asia, or "the Indies," they were called W. Indies, in contradistinction to the E. Indies, which soon after were reached by a route around the Cape of Good Hope. The first Spanish settlement in the New World was on the island of Santo Domingo (1493), and from it, directly or indirectly, nearly all the other Spanish conquests radiated. The Spaniards also settled Cuba, Jamaica, and Porto Rico, and had a small colony on Trinidad; but from the first they despised the smaller islands, and, after the rich discoveries in Mexico and Peru, the W. Indies were neglected. During the seventeenth century various French, English, and Dutch adventurers settled in the Caribbean islands and the Bahamas, and the Spaniards made only feeble attempts to dislodge them. In 1640 the sugar cane began to be planted systematically, and led to wonderful prosperity, which attracted immigrants, 50,000 British subjects arriving in Barbados alone in one year. Jamaica was seized in 1655 by the English, who have held it ever since. Bands of adventurers and freebooters, drawn together by their common hatred of the Spaniards, at length formed the roughly organized body called the buccaneers, with their principal stronghold in Tortuga; thence they ravaged the towns of the Greater Antilles and the Spanish Main, eventually crossing the Isthmus of Panama to the Pacific. French buccaneers from Tortuga passed over to the W. part of Santo Domingo, which was soon recognized as a French colony. (See BUCCANEER.) In 1660 a division of the islands was agreed upon between England and France. The French Revolution led to the independence of Santo Domingo, and it is now divided between the republic of Haiti and the Dominican Republic. The Bahamas were settled and retained by the English.

During the wars of the eighteenth and early part of the nineteenth centuries the Caribbean islands frequently changed hands, either by conquest or treaty; the greater part now belongs to Great Britain. France holds Martinique, Guadeloupe, and some smaller islands; Denmark has three islands in the Virgin group—St. Croix, St. Thomas, and St. John; the Netherlands retain Curaçao and some neighboring islets, with a settlement in the Caribbean group; and Venezuela holds Margarita and some of the other islands near her coast. All the possessions of Spain in the W. Indies were relinquished by the Treaty of Peace with the U. S. in 1898, Cuba becoming an independent republic, and Porto Rico being held by the U. S. African slaves were early introduced in most of the islands, and their (freed) descendants of negro or mixed blood form a large proportion of the population. Of the Carib and other Indian tribes which occupied the islands before the Spanish conquest, only remnants survive. Some of the islands under British dominion have imported large numbers of Hindu coolies as workmen. The larger islands are treated separately.

West'inghouse, George, 1846- ; American inventor; b. Central Bridge, Schoharie Co., N. Y.; educated at the public and high schools, and Ph.D., Union College, 1890. He served in the Civil War, 1863-64, and was assistant engineer, U. S. navy, 1864-65. He invented a device for replacing derailed cars, 1865, and patented his invention of the air brake, 1868, but it was later improved. In addition to developing alternating-current machinery, he built the first great dynamos at Niagara and for the elevated and subway roads of New York City. He devised a system for the control and distribution of natural gas. The works which he has organized and controls in the U. S. and Europe are among the largest in the world.

West'minster Ab'bey, a conventual church in Westminster, London. The monastery and church were dedicated to St. Peter, but as the sovereigns of England have been crowned in the abbey church for the last one thousand years, and as it is the place where persons of celebrity have been buried for nearly as long, the church building itself has a special repute, although the monastery has disappeared.

Long before any portion of the present building was in existence there stood upon the same spot a Saxon church. That church, built within Thorny Isle, was connected with the Benedictine order, who named the place the Western Monastery, or Westminster, to distinguish it, some say, from St. Paul's, in London, called East Minster. The first church here of which we possess any knowledge was that built by Edward the Confessor, and consecrated December 28th, 1065, and there still remains under what is called the pyx house, a noble crypt pertaining to the Norman structure. Henry III rebuilt the greater part of the abbey church in the Early English style. He had previously raised a Lady chapel at the E. end, and transferred the high altar to the place it now occupies, and reared behind—between it and the Lady chapel—a shrine, to which he removed the body of Edward the Confessor. That shrine still remains. The nave was built under the Edwards, and the W. front and its grand window, as well as the completion of the nave and aisles, belongs to the fifteenth century. Henry VII pulled down the Lady chapel, and built that which now bears his name, a charming specimen of the florid, Late Perpendicular style, with richly mullioned windows and roof in fan vaulting. Sir Christopher Wren was the architect of the upper part of the W. towers, which are by no means in keeping with the rest of the church. The height of the roof is 102 ft., an unusual elevation in England. The present cloisters were built in the thirteenth and fourteenth centuries. The chapter house is an architectural gem of abt. 1250.

The coronation stone brought from Scotland by Edward I is under the coronation chair used by Richard II, which ever since has been used by the English sovereigns. The funerals of kings and queens have also taken place in the minster. The remains of Oliver Cromwell were for a time in a vault under Henry VII's chapel. In the chapter house the Commons met when that body became an assembly distinct from the Lords, and repeated their sittings there as late as the end of the reign of Henry VIII. The history of the abbey is interwoven with that of the English Reformation. While Dr. Stanley was dean (1863-81) proceedings occurred in the abbey of national interest. Sermons on Sunday evenings have been preached here to vast audiences; and for a number of years—on the evening of St. Andrew's Day, November 30th, set apart for intercession on behalf of missions—a layman professor, Max Müller; a Presbyterian clergyman, Dr. John Caird, and a Congregational missionary, Dr. Robert Moffat, delivered lectures from the lectern in the center of the nave; also, celebrations by Roman Catholics have been held within its walls since 1890.

The tombs and monuments in the abbey are exceedingly numerous. Sovereigns and members of royal families have graves and tombs in the chapels of Edward the Confessor and Henry VII. In the center of Henry VII's chapel the founder and his wife repose side by side; at the W. end is the sepulcher of Edward VI. In the N. aisle are Queen Elizabeth and her sister Mary; in the opposite aisle is Mary Queen of Scots. Close to the tomb of Henry VII we meet with the grave of King James; Charles II is buried at the E. end of the N. aisle. His grave is unmarked; so is that of William III. Queen Anne was laid next her sister Mary in the S. aisle. George II was the last of the kings interred in the abbey. The interment was in Henry's chapel. The N. transept is distinguished as the resting place of eminent statesmen—Pitt, Fox, Wilberforce, Canning, Peel, Palmerston. In the S. transept is "Poets' Corner." Here lie Chaucer, Spenser, Beaumont, Ben Jonson, Cowley, Dryden, Addison, Tennyson, Browning; also hard by are monuments to Shakespeare, Milton, Goldsmith, and Johnson. Numbers of generals, admirals, courtiers, divines, men of letters, etc., are covered by the marble pavement or have memorials by the pillars or on the walls. Two slabs on the central floor of the nave mark the last home of George Stephenson and David Livingstone. Longfellow is the only American whose memorial stands in the abbey.

Westminster Assem'bly, an assembly which convened in Westminster Abbey, London, in 1643, and which has exercised a great and lasting influence on the history and development of Presbyterianism.

Westminster Hall, a large hall, all that remains of the ancient palace of Westminster. It is a very large room to have a roof unsupported by columns, being 68 ft. wide in the clear, and covered by an open timber roof, the finest in existence, and which has remained perfect, except for minor repairs, since the fourteenth century. In its present form it was built during the reign of Richard II. Westminster Hall has been the scene of many stirring events. Here Sir Thomas More and the Protector Somerset were tried and condemned. King Charles I here appeared before the High Court of Justice, while the banners of Naseby hung over his head. Here the seven bishops just before the revolution were acquitted, Dr. Sacheverell and the rebel lords of 1745 were convicted, and Warren Hastings passed through that ordeal which has been rendered so famous by the eloquence of Burke and Sheridan. Here, too, Oliver Cromwell was inaugurated as Lord Protector of England. Westminster Hall was the center of the English law courts; abutting on it were the Court of Chancery, the Court of King's or Queen's Bench, the Court of Common Pleas, and the Court of Exchequer.

Westminster Pal'ace, the building fronting on the Thames in the SW. part of London in which are the meeting rooms of the houses of Parliament of Great Britain and Ireland, together with libraries, committee rooms, etc. It takes its name from the royal palace which formerly stood on this site, but which was nearly abandoned at the time of Henry VIII. The houses of Lords and Commons assembled within the old walls. The latter began to meet in St. Stephen's Chapel in the reign of Edward VI. St. Edward's, or the Painted Chamber, was used by the Lords and Commons for conferences. In 1834 fire destroyed the whole pile, so long interwoven with the royal and national history of England.

Westpha'lia, province of Prussia; bounded by the Rhine province, Holland, Hanover, Schaumburg-Lippe, and Lippe-Detmold, Brunswick, Hesse-Nassau, and Waldeck. It has existed in its present form since the Vienna Congress of 1815. Area, 7,802 sq. m.; pop. (1905) 3,618,090, Germans, most speaking a dialect tending toward the Low German, or Plattdeutsch. The surface is mountainous or hilly, except in the circuit of Münster, which is a plain. The Ems, the Vechte, and the Lippe are the natural waterways, so far as they are navigable. Manufacturing and agriculture are the chief industries. The soil is barren in the N. and NE., but very fertile in the S. valleys. Westphalia's chief wealth is in its mineral treasures. Next to the Rhine province it is the richest province in iron; in zinc it is next to Silesia; in copper next to Saxony; and richest of all in coal, lead, sulphur, antimony; also in marble, stones, slate, and salt deposits. There are mineral springs, some of them quite famous. Besides ironworking and stonecutting, all kinds of textile industries have been carried on since the fourteenth century around Bielefeld. Grain and flax, hemp and hops are raised in large quantities; the foremost commercial cities are Bielefeld, Iserlohn, Dortmund, and Minden, the port on the Weser. Hamm is the railway center. The province is divided into the three circuits: Münster, Minden, and Arnsberg. The seat of the highest provincial administration is in Münster, where there is a Roman Catholic theological and philosophical academy (university until 1818).

Westphalia, Peace of, the name given to the peace concluded in 1648 at Münster and Osnabrück, by which an end was put to the Thirty Years' War between the Roman Catholics and the Protestants in an attempt to establish the authority of the German Emperor over the religious interests of Germany. By this peace the sovereignty of the members of the empire was acknowledged. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The elector palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received W. Pomerania, Bremen, Verden, Wismar, and a sum equal to £750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire.

The chief features of the Peace of Westphalia are the following: It established the equality of the Calvinists, Lutherans, and Catholics in Germany. It made the states of the empire almost independent of the emperor, thus preventing the attainment of national unity, and preparing for the rise of Prussia as a great Protestant power and the rival of Austria. It further gave to Sweden and France the right of continual interference in the internal affairs of the empire. Its adjustment of European affairs was, of course, not permanent, but it is the basis of almost all European treaties down to the time of the French Revolution, and it marks the end of the period of religious wars between European nations, whose points at issue were thenceforth to be mainly political.

West Point, military post and seat of the U. S. Military Academy; Orange Co., N. Y.; on the Hudson River, 52 m. N. of New York, 94 m. S. Albany. The E. side of the Point is a nearly straight, precipitous shore, while the N. side, curving so as to form a bay at its W. extremity, has a gentle slope, and commands a fine view up the river. On the NW. of this slope is Camp Town, containing barracks, storehouses, etc. Farther N., at the extremity of a plain called the German Flats, is the cemetery, and still a little to the N. is Washington's Valley, where stood the house occupied by Washington in 1779. The Military Academy is on a level terrace 160 ft. above the river, flanked on the W. by rocky heights; of these the one on which stands the ruins of Fort Putnam is the nearest and most prominent. On the S. the heights approach the river, leaving only room for a road S., leading to the village of Highland Falls and to Forts Montgomery and Clinton. A road W. over the mountains leads to Newburg and the surrounding country. Just N. of the island are the West Point Foundry and the village of Cold Spring; farther N. rises the lofty Bull Hill, with Breakneck in the distance. NW. of the Point, on the W. side of the river, are Crow Nest and Storm King, and beyond is the town of Newburg, at the extremity of the upper reach of the river, which viewed from West Point appears like a mountain lake.

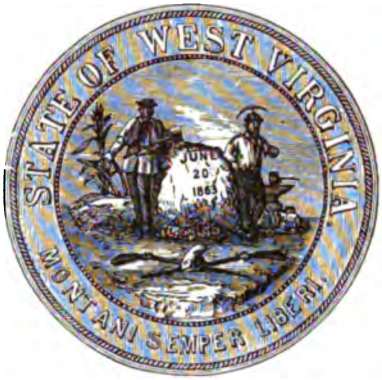
The Government tract of land at West Point contains about 2,330 acres, most of which was purchased in 1790. Jurisdiction was ceded by New York to the U. S. over a part of the tract in 1826, and over the remainder in 1875 and 1889. Between 1902 and 1906 Congress appropriated $7,500,000 for additional buildings and the general improvement of the site.

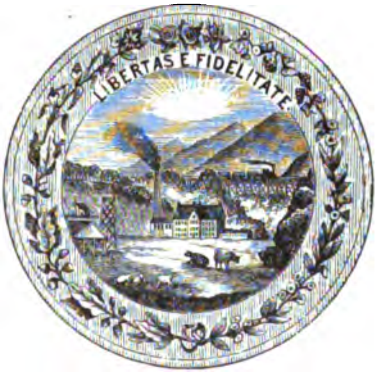
Among the many statues and memorials is a monument, surmounted by "Victory," erected to the memory of those of the regular army who fell in the Civil War.

West Virgin'ia, one of the U. S. of N. America, the twenty-second state admitted into the Union; popularly known as the PAN HANDLE STATE; capital, Charleston. It is bounded on the NW. by Ohio, on the N., NE., and ENE. by Pennsylvania and Maryland, and on the E., SE., and S. by Virginia, and on the SW. by Virginia and Kentucky; area, 24,715 sq. m.; pop. (1910) est. at 1,250,000.

On the E. border of the state are the Alleghany Mountains proper, lofty spurs of which trend NW. toward the Ohio. Three physical regions are indicated: (1) The E. plateau, on which is the loftiest mountain elevation in the state; (2) the central plateau, which stretches across the state from N. to S., having a mean elevation of about 1,000 ft. and an average width of about 25 m. On its S. portion, a continuation of the Cumberland range, are lofty elevations, some of the peaks of which are from 3,000 to 3,500 ft. (3) The Ohio valley plain, along the Ohio River and the entire NW. border of the state. Here the elevation is from 575 to 850 ft. In addition to these is the Potomac region, drained by the upper waters of the Potomac.

There are no transportation soils; all are native, and come from the breaking up of limestones, sandstones, and various admixtures of shales and clays, forming, respectively, flinty soil, sandy soil, and clayey soils and loams. These elements insure great fertility, and the lands are therefore productive to the mountaintops. Wheat, corn, and all the cereals yield abundantly. Almost all the fruits known to the temperate zone are grown, and fruit culture is developing rapidly. The state lies central in the great blue-grass region, which stretches from the banks of the Kentucky River to the lakes of W. New York.





W. Virginia has a coal area of 16,000 sq. m., divided into five districts—*viz.*, the Flat Top, Kanawha, New River, Northern, and Upper Potomac. The production of petroleum is second only to Pennsylvania, and includes a natural lubricating oil of high grade. Salt is also produced. The quarry products are limestone and sandstone. The value of the natural gas consumed exceeds $2,000,000. The iron-ore production is also important. The climate is salubrious and agreeable. The warm season is long, but the heat is not intense. The mean annual temperature of the whole state is 56.4°, and the average rainfall 44.2 in.

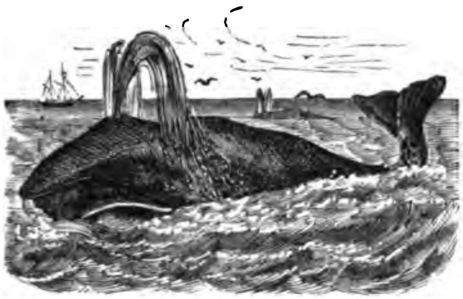
W. Virginia is divided into fifty-five counties. Important cities and towns are Wheeling, Huntington, Parkersburg, Charleston, Martinsburg, Fairmont, Grafton, Moundsville, Bluefield, Benwood, Clarksburg, Hinton, Sistersville, Wellsburg, Weston, Keyser. The census of 1905 showed that 2,109 factories reported, with an output valued at $74,177,681. The principal industries, according to the value of output, were the manufacture of iron and steel, lumber-mill products, flour and grist-mill products, coke, glass, planing-mill products, tanned and curried leather, malt liquors, cigars and cigarettes, and foundry and machine-shop products. The production of pig iron was 291,066 long tons in 1907. Coal mining is the distinctive industry. The manufacturing establishments are chiefly in the N. of the state and along the Ohio River, on account of the shipping facilities and the abundant supply of bituminous coal and natural gas. Three great trunk lines cross the state from E. to W.—the Baltimore & Ohio, the Chesapeake & Ohio, and the Norfolk & Western. The total mileage in 1908 was 3,415.69. The public-school system embraces primary, graded, high, and normal schools and a state university. The state normal school, Marshall College, is at Huntington, with branches at Fairmount, Glenville, Shepherdstown, W. Liberty, and Concord. An institute for colored teachers is at Farm. The state university, open to both sexes, at Morgantown, is one of the best-equipped institutions of its kind in the South. The institutions include a penitentiary, at Moundsville; reform school for males, at Pruntytown; school for the deaf and blind, at Romney; First Hospital for the Insane, at Weston; Second Hospital for the Insane, at Spencer.

The governor, auditor, state superintendent of free schools, treasurer, and attorney-general, all elected for four years, constitute the executive department, and also compose the board of public works. The legislature consists of a senate of twenty-six members, each elected for four years (half every two years), and a house of delegates of seventy-one members, each elected for two years. Sessions of the legislature are held biennially, and limited to forty-five days. The judiciary comprises the Supreme Court of Appeals, circuit courts, corporation courts, and justices of the peace.

The territory now embraced in W. Virginia was first visited by a white man, John Lederer, in 1669–70, when he was in the service of Gov. Berkeley as an explorer. The same year Robert Chevalier La Salle saw the W. part of the state when descending the Ohio River. The Knights of the Golden Horseshoe accompanied Gov. Spotswood, of Virginia, over the Blue Ridge in 1716. John Van Metre traversed the valley of the S. branch of the Potomac abt. 1725. The first white man to make a home within the present limits of the state was Morgan Morgan, who built his cabin in what is now Berkeley Co. in 1727. The land grant of Lord Fairfax for the "Northern Neck" of Virginia extended far into what is now W. Virginia, and the Fairfax surveyors, on October 17, 1746, planted the "Fairfax Stone" at the head waters of the N. branch of the Potomac to mark the W. limit of the grant. France claimed by right of discovery all that part W. of the mountains, and when the English began to cross the mountains France sent an expedition from Canada to bury leaden claim plates at the mouths of the principal tributaries of the Ohio. In the French and Indian War of 1755 Gen. Braddock marched through the E. part of the state to the fatal field of Monongahela. The Shawnee Indians had numerous towns and villages in this region, but the title to all the territory included in the state appears to have been vested in the Six Nations, for by them the land was ceded to the King of England by the treaty of Fort Stanwix, now Rome, N. Y., in 1768. The Shawnees, Delawares, Mingoes, and other tribes N. of the Ohio, however, claimed that the territory thus ceded belonged to them, and, refusing to yield it, waged war along the Virginia border from the date of cession until the treaty of Greenville, in 1795. In this period there were many bloody engagements on the soil of W. Virginia, and at Point Pleasant, at the mouth of the Great Kanawha, on October 10, 1774, occurred the most desperate battle ever fought with the Indians in Virginia. When the Revolutionary War opened the pioneers of this region were the first troops from S. of the Potomac that joined Washington at Boston. When Virginia seceded, a majority of the people W. of the mountains resolved to remain in the Union, and set about the formation of a new state. The first Wheeling convention was held in May, 1861, and the second Wheeling convention, June 11th, provided for the organization of a new state. June 20, 1863, W. Virginia was admitted to the Union. The present constitution was adopted in 1871.

Weyler y Nicolan (wī'lĕr ī nī'kō-lä), **Valeriano**, Marquis of Teneriffe, 1838– ; Spanish general; b. Palma of Mallorca (Baleares); entered the infantry school, 1853; lieutenant general, 1878; was commander in chief in the Philippines, Cuba, Madrid, etc.; was an attaché in the U. S. during the Civil War, and accompanied Sheridan on some of his cavalry raids. In the Carlist War, in Africa against the Moors, and in Cuba he gained such a reputation for brutality that he was nicknamed "Butcher Weyler." He was recalled from Cuba in 1897, as the U. S. protested against his methods. He has since been commander in chief of Madrid and Minister of War.

Whale (hwāl), popular name of the carnivorous cetacean mammals, with fishlike forms. The whales embrace the largest of living animals, and were regarded as fishes till the time of Linnæus; they are, however, true mammals, warm blooded, air breathing, bringing forth their young (usually one) alive, and suckling them. They occur mostly in shoals in the Arctic and Antarctic seas, and are seen sporting on the surface of the ocean. In the *Balænidæ* the adults have no teeth; the upper jaw is provided with cross plates of the horny substance known as whalebone or baleen, with fringes on the inner edge acting as a strainer for the food, which consists chiefly of small swimming mollusks and medusæ or jelly fishes. The right or Greenland whale (*Balæna mysticetus*) attains a length of 60 to 70 ft., the tail being 5 or 6 ft. long and 20 to 25 ft. wide; the general color is blackish above and grayish white below; the mouth is 15 or 16 ft. long, 6 to 8 ft. wide, and 10 to 12 ft. high inside; the eyes are not larger than those of an ox; the tongue is soft, thick, fatty, and very slightly movable; the tail is of immense power. The ordinary rate of progress is 4 or 5 m. an hour; they swim not far beneath the surface, and throw themselves in sport entirely out of water; they are fond of immersing the body perpendicularly and flapping the tail on the surface, making a sound heard for 2 or 3 m.; they usually come up every eight or ten minutes, but can remain down half an hour or more; they generally keep on the surface about two minutes, during which they blow eight or nine times, and then descend; they feed swimming just below the surface, with the mouth wide open.



RIGHT WHALE.

The *Physeteridæ*, or sperm whales, have no baleen plates, but forty to fifty conical teeth in the lower jaw with internal cavities; this is shorter and narrower than the upper, and completely inclosed by it when the mouth is shut, the teeth fitting into cavities in the upper jaw; the head is one third the whole length of the body, most of its bulk consisting of a gristly envelope or "case," which contains an oily fluid hardening on exposure to the air, and known as spermaceti. The best-known and largest of the sperm whales is the *Physeter macrocephalus*, or blunt-headed cachalot. The males attain 60 to 75 ft., and the females are about half as long; the color is blackish and greenish gray above, whitish beneath and about the eyes. They are distributed in all seas, but principally in the S. hemisphere, living in deep water, and rarely approaching land; they are usually seen in companies of twenty to fifty females and young, with one or two old males or bulls; they feed chiefly on cuttlefishes and other mollusks; the males fight savagely. They make sixty or seventy respirations while remaining about ten minutes at the surface; when the spoutings are over, if undisturbed, they descend, remaining down from half an hour to an hour. Their oil is the finest for burning, and the spermaceti (of which a single whale sometimes yields more than a ton) valuable for candles and for medical purposes; ambergris, highly prized in the making of perfumery, is a product of the intestines of the sperm whale; the blanket or blubber of a single individual will yield 80 or more barrels of oil.

SPERM WHALE.

Whale'bone, or Baleen', the substance of the horny plates or blades in the mouth of the *balæna*, or right whale, about 300 in a full-grown animal, from 10 to 15 ft. long. It is used for the ribs or stretchers of umbrellas and parasols, for stays, brushes, and whip handles, in haircloth, for hats and bonnets, canes, and other articles. The increasing price has led to the substitution for it of steel, vulcanite, and rattan.

Wharf, a broad plain space or surface resting upon the shore of a harbor or a navigable stream, affording a convenient place at which vessels may load and unload. It must abut upon the space where the tide ebbs and flows, that it may extend beyond that space. It is a settled doctrine of the common law that this portion of land between high and low tide, called the "shore," belongs to the government, and that the harbor or river beyond the lowest ebb is under the exclusive control of the government. In Great Britain the crown, in the U. S. the several states, hold the power to authorize and regulate the construction and use of wharves. This authority may be ceded away, either to municipal corporations or to private persons.

WHARFING is the business carried on by the occupant of a wharf, who is termed a wharfinger. He is a bailee for hire, receiving and keeping the goods placed in his custody; is entitled to demand a compensation, called wharfage, for the privilege of mooring a vessel at his wharf and there receiving or discharging her cargo, and for the storage of goods; is bound to exercise ordinary care and diligence of the goods, and is responsible for losses caused by ordinary negligence. He has a general lien on the goods of a customer for any balance due him on account.

Whate'ly, Richard, 1787-1863; archbishop of Dublin; b. London; studied at Oriel College, Oxford; entered the Church of England; Prof. of Political Economy, Oxford, 1830-31; Archbishop of Dublin, 1831. He opposed the Tractarian movement (*q.v.*). He was for twenty years the leading member of the Irish National Board of Education. Archbishop Whately was one of the founders of the "Broad Church" party, and was distinguished for "large munificence, genial hospitality, ever-ready wit, and solid common sense."

Spring Wheat.

Winter Wheat.

Wheat, a cereal, *Triticum vulgare,* which has been cultivated from the earliest antiquity, and now furnishes the principal breadstuff in all civilized countries. The varieties of wheat are numerous. The plant differs in stature, habit, and foliage, in the size and shape of the spike or head, the number of flowers in the spikelet, the shape and size of the floral envelopes, the presence or absence of a beard or awn and its character, and the size, form, color, and hairiness of the grain. Probably not more than a dozen varieties are in general cultivation in the U. S., though each is apt to have several local names, and a variety if long cultivated in one district may seem much unlike the same that has been grown for several years in a different locality. Spring wheat is sown and harvested the same year, while winter wheat is sown in autumn, usually in September, when it germinates, and the plant grows until stopped by cold weather; it remains dormant during the winter, and renews its growth in the spring, ripening about midsummer. These groups are subdivided into white and red or amber varieties, and these again into bald and bearded wheat. The red kinds are generally more hardy than the lighter-colored grains. Among the spring varieties, the China, also called tea wheat; the Mediterranean spring, and Canada club are leading kinds. Of winter wheats the white varieties are most esteemed. Formerly spring wheats brought a lower price than the others, but since the recent introduction of what is called the " new process " of grinding, in which the grain is first deprived of its outer covering, they are preferred for some kinds of flour, and bring as much or more than the winter kinds. Wheat in a rotation is sown on a turned clover sod, or on land which has been heavily manured the previous year for a corn or root crop; fresh stable manure is objectionable, but artificial fertilizers are used, and lime, where there is much organic matter in the soil, is beneficial. Continued cultivation, by ordinary methods, without manure, so exhausts the land that the crop becomes unprofitable. In some of the W. states of the U. S. large areas formerly given to wheat are now used for other purposes on account of the exhaustion of the soil for this crop. Wheat removes from the soil a much larger amount of nitrogen than either of phosphoric acid or potash. Careful cultivators take great pains to clean their seed wheat from other seeds, and to get rid of all the light kernels; when smut is apprehended, the seed is wetted with a solution of sulphate of copper or strong brine, to kill the fungous spores. The seed is sown broadcast, or preferably by means of a drill, which deposits it in rows and covers it; when sown broadcast it is harrowed or plowed in. In spring the winter wheat is harrowed. Wheat properly stands at the head of food grains, as it contains, besides a large amount of starch, nitrogenous principles, and those mineral elements required by the animal system; the grain raised in different soils and climates, as well as that of the different varieties, shows considerable variation in the proximate constituents. One of the greatest enemies to the wheat plant in the U. S. is the Hessian fly, a small two-winged gnat, resembling a mosquito. It produces two or three broods, the fly laying its eggs in the autumn between the leaf and the main stalk, where the young pass the winter. In the spring the adult emerges and lays eggs between the leaf and stalk farther from the ground. The stalks are weakened and produce a poor quality of grain, many stalks breaking over and remaining ungathered by the reaper. Late seeding is practiced to prevent or diminish its ravages. Chinch bug has done great injuries in the states drained by the Mississippi. It is a small insect, not more than one sixth of an inch in length. The eggs are deposited beneath the ground, the young feed on the roots, then the leaves. Their numbers are often so great that whole crops are destroyed. The most effective means of combating them has been by spreading a contagious disease among them by means of infected bugs. Spraying the fields with insecticides and burning the stubble are recommended. Wheat midge, a small gnat, deposits its eggs in the wheat blossoms. The young feeding on the undeveloped grain cause it to shrivel. No remedy is known. Varieties known as bearded and longberry red are most likely to escape ravages. The white grubs of the May beetles frequently do much damage to young wheat in the fall by feeding upon the roots. Skunks and crows often come to the relief of the farmer at this time and destroy large numbers of these insects. Wire worms, the larval form of click beetles, feed on the roots of wheat. No satisfactory remedy has been found, although thorough tillage and compacting the soil has proved beneficial.

It was estimated that the world's production in 1907 was as follows in bushels:

United States..	664,602,000	Great Britain...	55,585,000
Canada........	114,534,000	Portugal.......	5,000,000
Argentina......	192,489,000	Russia in Europe......	569,484,000
Chile..........	17,000,000	British India...	229,092,000
Austria........	62,170,000	Egypt..........	25,000,000
Hungary proper..........	152,204,000	Algeria........	28,000,000
Roumania.....	54,813,000	Australasia.....	51,730,000
Turkey in Europe......	25,000,000	Mexico........	8,000,000
Bulgaria.......	47,072,000	Turkey in Asia .	35,000,000
Italy..........	150,792,000	Croatia-Slavona	13,228,000
Spain..........	119,970,000	Servia.........	14,000,000
France.........	310,526,000	Japan.........	22,466,000
Germany......	138,442,000	Other countries.	58,894,000
Belgium.......	13,000,000	The world....	3,181,115,000

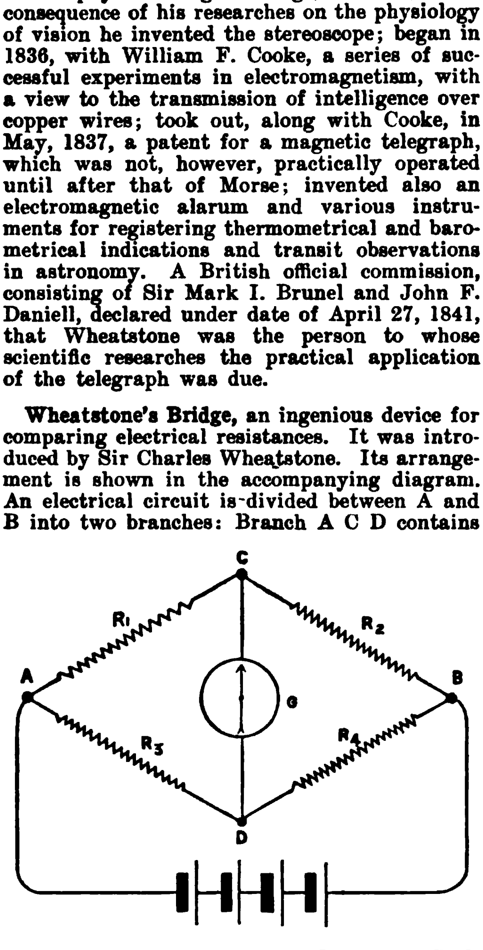
In the U. S. the average production in 1880–89 was 449,695,359 bu., and in 1890–1900 504,818,969 bu. The largest annual production was in 1901, 748,460,218 bu. In 1909 the production was 730,046,000 bu. See Flour.

Whea'ton, Henry, 1785–1848; American lawyer and diplomatist; b. Providence, R. I.;

graduated at Brown Univ., 1802; admitted to the bar, 1805; practiced at Providence, 1807–12, and settled in New York, 1812; edited the *National Advocate*, 1812–15. He was reporter of the Supreme Court of the U. S., 1816–27; *chargé d'affaires* to Denmark, 1825–35; minister, 1835, and plenipotentiary, 1837–46, to Prussia. In 1847 he was lecturer on international law at Harvard. His most important work is "Elements of International Law," which has been several times translated.

Wheat'stone, Sir Charles, 1802–75; English physicist; b. Gloucester, England; was in early life a maker of musical instruments; investigated the laws of sound and their application to music; became in 1834 Prof. of Experimental Philosophy in King's College, London; as a consequence of his researches on the physiology of vision he invented the stereoscope; began in 1836, with William F. Cooke, a series of successful experiments in electromagnetism, with a view to the transmission of intelligence over copper wires; took out, along with Cooke, in May, 1837, a patent for a magnetic telegraph, which was not, however, practically operated until after that of Morse; invented also an electromagnetic alarum and various instruments for registering thermometrical and barometrical indications and transit observations in astronomy. A British official commission, consisting of Sir Mark I. Brunel and John F. Daniell, declared under date of April 27, 1841, that Wheatstone was the person to whose scientific researches the practical application of the telegraph was due.

Wheatstone's Bridge, an ingenious device for comparing electrical resistances. It was introduced by Sir Charles Wheatstone. Its arrangement is shown in the accompanying diagram. An electrical circuit is divided between A and B into two branches: Branch A C D contains two resistances, R_1 and R_2. Branch A D B contains two resistances also, R_3 and R_4. Whenever C and D are at the same potential no current will flow through the galvanometer, the terminals of which connect those points. C and D will be at the same potential whenever $\frac{R_1}{R_2}=\frac{R_3}{R_4}$. When R_2 and the ratio $\frac{R_3}{R_4}$ are known, R_1 is given by the above equation. The method of procedure consists in "balancing" the bridge by a variation of the known resistances until no current flows through the galvanometer. Its convenience, accuracy, and adaptability are such that it has become the most widely used of all methods of measuring electrical conductivity. The bridge is sometimes called Wheatstone's balance.



Wheel, an instrument formerly used as a means of torture and of execution in criminal procedure, the torture or execution being called *breaking on the wheel.* It is said to have been first used in Germany, where the criminal was laid on a cart wheel and his extended limbs fractured with blows of an iron bar. In other countries a different form of frame was used, such as a St. Andrew's cross. Breaking on the wheel was abolished in France at the revolution, but was used in Germany as late as 1827. The agony of the victim was ended by strangling or a few violent blows called *coups-de-grace,* or strokes of mercy. It is now obsolete in all civilized countries.

Wheel and Ax'le, one of the so-called mechanical powers. It is an application of the principle of the lever. There are two cylinders with a common axis, with differing radii—the smaller being termed the *axle,* the larger the *wheel.* Suppose a cord is wound around the wheel in one direction, and another cord around the axle in the contrary direction. The condition of equilibrium of weights attached to these cords is that the product of each of the weights into their respective radii should be equal.

Wheel'er, Joseph, 1836–1906; American soldier and legislator; b. Augusta, Ga.; graduated U. S. Military Academy and appointed a brevet second lieutenant of dragoons, 1859; resigned April 22, 1861, and entered the Confederate service as lieutenant of artillery. He was rapidly promoted to lieutenant general, and commanded the cavalry corps of the W. army from 1862 until the close of the Civil War. He served with distinction at Shiloh, Corinth, Perryville, Murfreesboro, Chickamauga, and in Georgia under Johnston and Hood, and covered the retreat from Shiloh, Corinth, and Perryville. He commanded the cavalry in Bragg's Tullahoma campaign and in Longstreet's movement against and Bragg's retreat from Knoxville. He opposed Sherman's march to the sea, checking his advance at Waynesboro and Aiken. Gen. Wheeler was noted for energy and vigilance, which enabled him to make many captures of prisoners and supplies. He was wounded three times and had sixteen horses shot under him. From 1881 to 1899 he was a member of Congress from Alabama. In 1898 he served in Cuba as a major general of volunteers, and was sent to the Philippines in 1899, and later retired.

Wheeler, William Almon, 1819–87; Vice President of the U. S.; b. Malone, Franklin Co., N. Y.; studied at the Univ. of Vermont; admitted to the bar in 1845, and rose rapidly. He was elected as a Whig member of the assembly (1849–50), but joined the newly formed Republican Party in 1856. He was a member of the senate of New York, 1858 and 1859, and its president *pro tem.*; member and president of the New York constitutional convention, 1867-68; a representative to the 37th, 41st, 42d, 43d, and 44th congresses. In the political complications which arose in Louisiana during the session of the 43d Congress, Mr. Wheeler was conspicuous, having been chairman of the special committee of the House of Representatives that visited Louisiana, and finally adjusted the difficulties existing there on the basis of "the Wheeler compromise." He was Vice President of the U. S., 1877-81, after which he lived in retirement.

Wheel'ing, capital of Ohio Co., W. Virginia; on the Ohio River, 63 m. W. of Pittsburg, 141 m. E. of Columbus, Ohio. Zane's Island, a ward of the city, is connected with the mainland by a suspension bridge of 1,010 ft. span and a steel bridge. Steamboats carry freight to all points on the Ohio and Mississippi rivers. There are two large parks outside the city limits, two within. The most notable buildings are the city hall and courthouse, U. S. customhouse, and post office. There are about forty churches and a synagogue. The public schools cost annually about $100,000. The charitable institutions are for the aged, friendless, and orphans, a Roman Catholic hospital, a day nursery, a Protestant hospital, and two private hospitals. Wheeling, the largest city in the state, is principally a manufacturing city. The large deposits of bituminous coal and the natural gas in the surrounding country furnish a cheap fuel. There are steel and iron plants with blast furnaces, a glass factory, potteries, steel tube and casing works, tobacco and cigar factories, foundries and stove works, breweries, ice plants, machine shops, planing mills, carriage factories, etc. The cigar factories have a daily output of about 1,000,000.

The first settlement of Wheeling was made by Col. Ebenezer Zane in 1769, and a stockade fort—Fort Henry—was built at Wheeling to protect the border in 1774. On September 1, 1777, this fort was beset by about 300 Indians, who killed 15 of the settlers. It sustained another attack in 1781, and again September 11, 1782, was besieged by a British captain and 40 regular soldiers and 260 Indians for two days, but they were repulsed by Col. Zane and his little garrison without loss. The town was laid out by Col. Zane in 1793; first incorporated, 1806; incorporated as a city, 1836; made the capital of the "restored government of Virginia" in 1861; was the meeting place of the convention which formed the State of W. Virginia in 1863; and was the capital of the state, 1863-70 and 1875-85. Pop. (1906) est. at 41,494.

Wheel'work. See GEARING.

Whelk, a name popularly applied in a vague manner to species of gasteropod mollusks belonging principally to the families *Buccinidæ* and *Muricidæ*. They form one of the chief elements of the food of the codfishes, and in England are sometimes used as an article of food, but their principal value is as bait. The shell of the almond or red whelk (*Chrysodomus antiquus*) of the market is used in the Shetland Islands and some other places for a lamp.

Whig and To'ry, designations of political parties in England, and in American history, originally terms of reproach. "Whig" is a contraction of "whiggamore," which in the SW. counties of Scotland denotes a drover. The term came into general use in 1679, during the struggle between the court and country parties on the bill for the exclusion of the Duke of York from the line of succession. "Tory" is derived from an Irish term applied to "the most despicable savages among the wild Irish," and the name was given to the followers of the duke because he favored Irishmen. The term "liberal" has supplanted "whig" in English politics, but "tory" is still applied to the "conservative" faction. In the U. S. "whig" was applied during the Revolution to the patriotic party, the adherents to the crown being called "tories." Both words then disappeared from the political vocabulary until the presidential election of 1832, when the anti-Jackson party took the name of whig. The party broke up in 1854-55.

Whip'ping Post, a post to which a person is tied to be whipped. The phrase is used, however, to designate the institution of whipping as a means of punishment or torture, especially for crime. As a means of torture, whipping or flogging has been in use among all nations in those stages where torture was inflicted. Until recent years its use, practically unlimited short of death, by shipmasters at sea to enforce discipline among their crews, has been universal, but its abuse led to its restriction or abolishment by statute in Great Britain and the U. S., and in some other countries. As a form of criminal punishment it was in use among the Romans, and at the common law whipping was inflicted on persons of inferior condition guilty of petty larceny or other minor offenses; but in the earliest times it appears not to have been inflicted on gentlemen. In Great Britain and the U. S. whipping as a punishment for crime remained legal for some time after its general use became almost obsolete. Thus in the U. S. in the early nineteenth century whipping had been abolished or became disused in most of the states, except as to slaves.

At present whipping is authorized by statute in only a few of the U. S.; but its use is constantly being advocated as a punishment for certain brutal crimes. The old laws of Great Britain allowed the whipping of women as well as men, but now, by 1 George IV, c. 57, no female may be whipped; and by later statutes, whipping may be inflicted upon males below sixteen years who have been convicted of any one of various offenses, such as malicious injury to property, larceny, embezzlement by servants or clerks, accusing of infamous crimes, etc., and the court usually specifies the number of strokes and the instrument to be used. In countries other than Great Britain and the U. S., whipping is still generally comparatively common as a form of criminal or political punishment.

Whip'ple, Abraham, 1733–1819; American naval officer; b. Providence, R. I.; early commanded a merchant vessel in the W. Indies trade; was captain of the privateer *Game Cock* during the French War, 1759–60, capturing twenty-three French prizes; headed, 1772, the expedition which burned the British revenue schooner *Gaspe* in Narragansett Bay; made commodore of two armed vessels which captured more British prizes than any other vessel, but was itself finally taken; commanded the light frigate *Providence*, with which he adroitly escaped from Narragansett Bay; captured eight richly laden vessels from the Jamaica fleet, 1779, and attempted with a squadron to relieve Charleston, S. C., from the British, but was captured and held a prisoner until the close of the war.

Whipple, William, 1730–85; a signer of the Declaration of Independence; b. Maine. He was a merchant of Portsmouth, N. H., and was a member of the provincial congress at Exeter in 1775 and of the continental congress in 1776. In 1777 he was a brigadier general, and commanded the New Hampshire troops at Saratoga; judge of the superior court of the state, 1782.

Whip'-poor-will (named in imitation of its cry), a species of American bird. They have a very small bill; the gape furnished with long, stiff, and sometimes pectinated bristles, which project beyond the end of the bill; the wings broad, rounded, and with the first quill shorter than the third; the tail broad and rounded. It is brownish gray, streaked with black. The chief distinctive characters, in contrast with the night hawks, are found in the bristled gape and the form of the tail, and in this respect, as well as others, the species agree with the typical goatsuckers of the Old World, to which they are closely related. The common species are nocturnal in their habits, remaining silent and keeping within the shady recesses of the forests during the daytime. In the early part of the evening, and then for only a brief period, they emit their peculiar cry, the notes repeated with great rapidity, but with clearness and power, six or seven times in as many seconds. They are to be heard chiefly in clear weather. In the daytime their haunts are deep ravines, shady swamps, and extensive pine groves. They lay their eggs upon the ground, generally among fallen leaves, and make no regular nest. Their eggs are two in number, and are white and somewhat spotted.

Whirl'wind, air in spiral inflowing motion, similar to a whirlpool in water. Whirling motions are common to all fluids, and are the rule in the atmosphere. When the conditions causing the whirling motion are symmetrical, a complete whirl results, and is called a whirlwind. This may be of any size, from the eddy at a street corner to a hurricane a thousand miles in diameter. In the former case the observer can see the entire whirl, in the latter he sees but a small part, and the wind at the point of observation is so slightly curved that it seems to be straight. The rotation of the earth gives a uniform direction to all whirls large enough to make its twist effective—from right to left in the N. hemisphere and opposite to this in the S. See CYCLONES; HURRICANES.

Whis'ky, or **Whiskey** (from Irish-Gaelic, *uisgebeatha*, "water of life," *eau de vie*), the spirituous liquor obtained by distilling fermented infusions of barley, rye, wheat, corn, oats, etc. According to some authorities, the art of distillation was first introduced in England in the reign of Henry II, but it is more probable that it was known and practiced in Ireland previous to this date. Directions for preparing *uisgebeatha* cr *aqua vitæ* are contained in the "Red Book of Ossory," compiled over five hundred years ago, at which time it was chiefly used as a medicine, being considered a panacea for all diseases. Spirits that contain over sixty per cent of alcohol are termed "high wines" or common spirits; those containing ninety per cent of alcohol are known as "cologne spirits," the name whisky being usually given to the product of a former distillation containing about fifty per cent by weight of alcohol. In Great Britain the largest amount of whisky is made in Scotland; large amounts are made in Ireland, chiefly in Dublin; in the U. S. the principal supply comes from Kentucky (termed Bourbon whisky, from Bourbon Co., Ky.), Pennsylvania (Monongahela Co.), Ohio, Illinois, Indiana, and Maryland; much is also made in Canada.

The grains used vary greatly. In Scotland and Ireland malted barley is extensively employed. For Bourbon whisky a mixture of fifty to sixty per cent of Indian corn with forty to fifty per cent of small grain (containing about ten per cent malt, the balance being rye) is taken; for Monongahela whisky, only rye is used, with ten per cent of malt; while in Canada a mixture of rye, wheat, or corn with five per cent of malted barley is employed. The quantity of alcohol afforded by the different grains is influenced by the proportion of starch, including the small amount of sugar, they contain; 2 lb. of starch will give a quart of spirit containing thirty per cent of alcohol. One hundred pounds of the following grains afford the following quantities of a spirit containing forty-five per cent of alcohol: Wheat, 40 to 45 lb.; rye, 36 to 42 lb.; barley, 40 lb.; oats, 36 lb.; buckwheat, 40 lb.; maize, 40 lb. In the making of whisky the starch of the grain is first changed into dextrin and glucose in the process of *mashing*, chiefly by the action of the *diastase* (a substance formed by the germination of the grain). Yeast is next added to the sweet liquid to induce fermentation, by which the sugar is converted into alcohol and carbon dioxide; and the alcohol is finally concentrated by distillation. The essential features of the process of whisky making are therefore the preparation of the mash and the distillation of the alcohol.

By carrying on the distillation to the farthest point, in order to obtain the most alcohol, a danger of promoting the formation of fusel oil is incurred. Fusel oil has a fiery and nauseous flavor, which is communicated to spirits containing it. Its complete removal can be effected by diluting the contaminated alcohol with water and redistilling, only the first part of the distillate being collected; but owing to the great expense thus incurred this is seldom resorted to. A large proportion of the whisky consumed in the U. S. and elsewhere is artificially prepared by reducing the raw products of the distillation of malt or potato spirits with water and adding certain substances to give flavor. Creosote, for instance, is sometimes added to impart a whisky flavor to inferior grades of spirit; methyl alcohol is also used, but probably to a less extent. Pure whisky is nearly colorless, but becomes brown when stored in casks. Whisky should contain from forty-eight to fifty-six per cent by weight of alcohol.

Whisky Rebel'lion, the popular resistance to the excise laws in the four W. counties of Pennsylvania in 1794. There whisky was the staple product, and in such general demand that, like tobacco in colonial times, it served as a medium of exchange. The usual price being a shilling a gallon, a tax of seven cents a gallon, as by the act of May, 1792, seemed excessive, and the law was further objectionable on account of the official inspection of private property which it entailed. Attempts to enforce the law met with violent resistance. The movement fast became an open rebellion, and the spirit of revolt was spreading to Virginia and Maryland. Washington acted with vigor, and made a requisition for about 13,000 militia from Pennsylvania, New Jersey, Virginia, and Maryland, and it was not till the troops had actually begun their westward march that the insurgents lost courage. Many arrests were made, and two of the prisoners were convicted of treason, but they were afterwards pardoned by the President. At the first show of force the insurrection subsided at once. It was the first attempt forcibly to resist the Federal Govt., and it decided the question whether the militia of one state would invade the soil of another at the call of the President, and that the precedent of a Federal excise was successfully established.

Whisky Ring, a combine of whisky producers and internal-revenue officers which, during the administration of Pres. Grant, defrauded the U. S. of several million dollars. At first Grant issued the order, "Let no guilty man escape." Over 200 persons were indicted, and a few were convicted, though most of these were later pardoned. The matter reflected much discredit on the administration, and public opinion was to the effect that Grant had allowed himself to be influenced by dishonest advisers against prosecuting the malefactors.

Whist, a well-known game at cards, first clearly described by Edmond Hoyle in his "Short Treatise on the Game of Whist," 1743. The game is played with the full pack of fifty-two cards by four persons, two being partners against the other two, each player receiving thirteen cards dealt out one by one in rotation. The last card dealt is turned face up, and is called the trump card; it gives a special power to the suit to which it belongs. The cards rank as follows: ace (highest), king, queen, knave, and the others according to their number of pips. Play is commenced by the person on the left hand of the dealer laying down a card face up on the table, the other players following in succession with cards of the same suit if they have them. When all have played, the player who has laid the highest card takes the four cards laid down, which constitute a trick. The winner of the trick then leads, as the first of a new trick, the winner of which becomes the leader, and so on. When a player cannot play a card of the same suit, he may play one of the trump suit, and take the trick, or lay one of a different suit, which gives him no chance of winning the trick. In dummy whist two are partners against one, who turns face up on the table his dummy partner's cards, which he plays to suit his own hand. The main point in the game is to lead up to dummy's weak suits and through his strong ones. In double dummy two single players each turn up their dummy partner's cards.

When the hand is played out the score is taken as follows: the partners who conjointly gain the majority of tricks score one point for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honors, and count one each for the side which holds them; if one side hold three honors, they count two by honors; if one side hold all the honors, four by honors is counted; should the honors be equally divided neither side counts. In *long whist*, an obsolescent form of the game, ten of these points made a game. In *short whist*, the game now generally played, the number has been reduced to five, and in this form it is common to count by tricks alone. A rubber consists of a series of three games, and is won by the side that secures two of them. Should one party gain two games in succession, the third of the rubbers is not played. See Bridge.

Whistler (hwĭs'lẽr), **James Abbott McNeill,** 1834–1903; American painter; b. Lowell, Mass.; educated at U. S. Military Academy, West Point; pupil of Gleyre in Paris; settled in London in 1863. His works are individual in character, and are notable for subtle color harmony. He was one of the greatest of modern etchers, and painted some masterly portraits. His "Portrait of My Mother," painted in 1872, was, in 1892, bought by the French Govt. His "Nocturnes" and "Symphonies" exhibit soft tints in wonderful combinations. He published "The Gentle Art of Making Enemies."

White, Gilbert, 1720–93; English naturalist. He became senior proctor of Oxford Univ. in 1752, but early retired to his native village of Selborne, Hampshire. His "Natural History of Selborne" is an English classic. He wrote also on the antiquities of Selborne.

White, Richard Grant, 1801–85; American scholar and critic; b. New York City; graduated at the Univ. of New York, 1839; admitted to the bar, 1845; associate editor of the New York *Courier and Enquirer*, 1851–58, and of the *World*, 1860–61; for nearly twenty years was chief clerk of the U. S. revenue marine bureau in the district of New York; wrote on music, Shakespeare, and literary and social subjects; "Memoirs of the Life of William

Shakespeare," 1865; an annotated edition of Shakespeare, 1857–65; "Words and Their Uses," "England Without and Within," 1881; "The Riverside Shakespeare," 1883.

White Ants. See TERMITES.

White'bait, a name given in England to small fishes which were long supposed to belong to a peculiar species, but which are now known to be merely the young of the common herring and the sprat (*Clupea sprattus*). The name is limited to fishes which are under 6 in. in length, and whose sides are almost uniformly white. Such fishes begin to make their appearance in the river Thames in England about the end of March or early in April, and are caught in immense quantities, being considered a delicacy.

White Cross Soci'ety, an association for the promotion of personal purity, especially among men, and advocating the principle of one law of morality for both men and women. The movement was inaugurated in England in 1883 by the Bishop of Durham. The society is now established throughout the U. S. and in Canada.

Whitefield (hwĭt'fēld), **George,** 1714–70; English clergyman; b. Gloucester, England. At Oxford he became intimate with Charles Wesley, was a member of the club from which Methodism took its rise, and cultivated extreme habits of asceticism. He was ordained deacon in 1736, and preached with effect. In December, 1737, he went to Georgia, and in September, 1738, returned to England to collect funds for a proposed orphan asylum near Savannah. On February 17, 1739, he set the example of preaching in the open air in a field near Bristol. From this time he traveled continually, preaching with marvelous results. In 1739 he went back to his orphan house in Georgia. He afterwards visited New England, preached to 20,000 persons on Boston Common, and in January, 1741, returned to England. He disagreed with Wesley on predestination, and the Calvinistic and Wesleyan Methodists have ever since remained distinct bodies. In September, 1769, he started on his seventh American tour. He preached for two hours at Exeter, N. H., the day before his death, and on his arrival at Newburyport the same evening addressed the crowd that came to meet him.

Whitefield's intellectual powers were not of a high order, but he had an abundance of that ready talent which makes the popular preacher; and beyond all natural endowments there was in his ministry the power of evangelical truth, and, as his converts believed, the presence of the Spirit of God. His voice was marvelously varied, and he ever had it at command—an organ, a flute, a harp, all in one.

White'fish, any fish of the family *Salmonidæ* and genus *Coregonus*. They are similar in form to the salmons and trouts, although less graceful, and with a stouter tail, but the scales are larger; the mouth has a narrow cleft, and the upper jaw projects more or less beyond it; the maxillary bones are short and broad, the teeth are wanting or extremely minute, the suborbital bones are well developed; the dorsal fin has thirteen to fifteen rays, the anal thirteen to sixteen; the stomach recalls a horseshoe by its form. The species are generally distributed in the colder waters, especially in lakes and ponds. About thirty species are known. The common whitefish, C. *albus*, of the lakes is one of the most important of the economical fishes of the great system of N. lakes. Extensive warehouses exist for its storage in and near the large cities and towns on the lake borders.

White House. See WASHINGTON, D. C.

White Moun'tains, a group of peaks in NE. New Hampshire, usually regarded as part of the Appalachian system. They rise boldly from a deeply eroded plateau, and are drained by several clear, swift streams. Of these the most important are the Saco, flowing SE. across Maine to the Atlantic, and the Androscoggin and Ammonoosuc, which flow SW. to Connecticut River. Several of the higher peaks in the E. portion of the range have been named in honor of presidents of the U. S. For this reason the name Presidential Range is applied to them. The W. portion of the group is known as the Franconian Mountains. The White Mountains culminate in Mount Washington (6,286 ft.), and with the exception of Mount Mitchell, N. Carolina (6,688 ft.), is the highest point in the U. S. east of the Mississippi. The more prominent peaks are Mount Adams, 5,819 ft.; Mount Jefferson, 5,736 ft.; Mount Madison, 5,381 ft.; Mount Clay, 5,554 ft.; Mount Monroe, 5,396 ft. There are, besides, many peaks of less prominence, all of which are forest covered, rugged, and picturesque. Of the Franconian group the only one exceeding 5,000 ft. is Mount Lafayette, 5,269 ft. The area of the entire group may be taken at about 800 sq. m. A station of the U. S. Weather Bureau has been maintained on the summit of Mount Washington since 1871. Since early in the nineteenth century the White Mountains have been much visited by tourists and seekers after health. For many years access was had to them by means of stagecoaches, but in time the railways came, on one of which a locomotive with cars attached climbs Mount Washington, rising 3,625 ft. in 3 m., the first railway of its kind. The White Mountains get their name from the dazzling, snowlike appearance of the mica schist of which their peaks are composed.

White Sea, a large inlet of the Arctic Ocean, penetrating into European Russia for 380 m., with a breadth of from 30 to 150 m. It is frozen from October to May, and is rich in herring and codfish.

White Swell'ing, popular name for a chronic inflammation of the joints. The disease is now recognized as a form of tuberculosis of the joints.

White Wal'nuts. See BUTTERNUT.

White'wash, a preparation of slaked lime, thinned to a milky consistence, and used for whitening walls. Skimmed milk, glue, zinc sulphate, tallow, and various pigments are sometimes added. Some of them form insoluble compounds with lime, and thus add to the permanency of the wash.

Whit'ing, a European fish of the codfish family. As in the true codfish, the body is moderately elongated and covered with small scales, the head conic, the mouth deeply cleft, the upper jaw longest; it differs from the true codfishes especially in that no barbel is developed at the chin; the color above is very dark and almost black, and below grayish; a black spot is developed on the pectoral fin. The species is esteemed for the excellence of its flesh, which is said to surpass in delicacy that of any other representative of the family. It is common in the seas of N. Europe, and is fished for throughout almost the entire year, but is more abundant in winter, when it approaches the shore—it is believed, to spawn. Its average size is about 12 or 16 in., weight 1¼ lb., although it sometimes attains 3 or 4 lb. It is voracious, and seizes mollusks, worms, and young fishes. It appears to prefer sandy banks, but shifts its ground frequently in the pursuit of the various fry of other fishes. Although claimed to be an inhabitant of the Atlantic coast, it has not yet been found thereon, the hake having been mistaken for it. On some parts of the coast the name "whiting" is also applied to the kingfish.

Whiting Pout. See BIB.

Whit'low, or Fel'on, a painful inflammation, ending in suppuration, of the tissues surrounding the bones of the hands and feet. The last joint of the fingers is the most frequent situation. The immediate cause is always some injury, but deterioration of the blood and general health predispose. A felon is an abscess beneath the fibrous sheath surrounding the bone, causing a tense swelling of the finger or toe, with redness and local heat, and pain of a throbbing and later boring character. The intensity of the pain is due to the fact that the pus is confined beneath the periosteum. In unfavorable cases, where no escape of the pus occurs spontaneously or as a result of incision, death of the bone, or necrosis, may take place, and a loss of one or more joints results. The treatment of felons should be early incision down to the bone. Poultices and soothing lotions are poor substitutes for the radical procedure.

Whit'man, Walt, 1819-92; American poet; b. West Hills, Long Island; educated in the public schools of Brooklyn and New York; learned the printing and subsequently the carpenter's trade; taught school; made extended pedestrian tours through the U. S. and Canada, 1847-48; edited for brief periods newspapers at New Orleans and at Huntington, Long Island; was a volunteer nurse in the hospitals at Washington and in Virginia, 1862-65; held clerkship in the Government offices at Washington most of the time from 1865-74; wrote "Leaves of Grass," "Drumtaps," and "Two Rivulets." His "Leaves of Grass," the title under which he at last included all his poems, has probably excited more discussion and called forth more hostile criticism than any other literary production of the time in which its author lived. It is an unrhymed, unmeasured work of over 10,000 lines, in its form aiming only to follow the law of the innate forms of organic nature, and in its substance celebrating life, sex, comradeship, democracy, America, as they are illustrated by the poet's own personality and environment. Whitman's ambition was not merely to be a sweet and popular singer, his scheme looked to much more than that; he would be a prophet and lawgiver of his country and time; he would rival in his day and land the character and office of the ancient teachers and seers. He deprecates any study of his work merely as literature or art, his final purpose being ethical and religious. His work has won high approval in Europe, but has been generally neglected or condemned by his own countrymen on account of its outspokenness, which in Massachusetts resulted in the authorities objecting to the sale of his "Leaves of Grass" on the ground of immorality.

Whit'ney, Eli, 1765-1825; American inventor; b. Westboro, Mass. He graduated at Yale, 1792. He studied law in Savannah, Ga., while residing in the house of the widow of Gen. Greene, and at her suggestion invented the cotton gin, to supersede hand cleaning at the rate of a pound a day. Before he could complete his model and obtain his patent, several machines based on his invention had been made, and were in operation. In 1793 he went to Connecticut to make the machines; but after a long struggle to secure justice he turned his attention to making firearms for the Government, from which he reaped a fortune. He was the first who made each single portion of the gun adapted to any one of the thousands of arms in use at the same time. His factory was at Whitneyville, Conn.

Whitney, Mt., a mountain in SE. California; 14,522 ft.; the highest peak in the U. S., not including Alaska. Its E. slope is precipitous, and rises nearly 11,000 ft. above Owens valley, which skirts its base. The summit was occupied by Prof. S. P. Langley in 1881 for the purpose of making observations on solar heat.

Whitsunday (hwĭt's'n-dā). See PENTECOST.

Whit'tier, John Greenleaf, 1807-92; American poet; b. East Parish of Haverhill, Mass., of Quaker parentage. He received a common-school education, spending his boyhood on a farm. He was eighteen when his first poem was published in William Lloyd Garrison's *Free Press.* He wrote the ode sung at the dedication of Haverhill Academy in 1827, and was a pupil there for two terms, paying his way in part by making slippers. In January, 1829, he was called to Boston to edit *The American Manufacturer,* a political newspaper. He was editor of *The Haverhill Gazette* in 1830. In July, 1830, he became editor of the *New England Review,* a political paper of Hartford, Conn. His principal ambition at this period was in the direction of political preferment, and he favored the policy of Henry Clay. For several years after 1832 he lived upon his Haverhill farm, a part of the time editing the *Gazette*.

In 1833 he wrote an antislavery pamphlet, "Justice and Expediency," and was a delegate to the National Antislavery Convention in Philadelphia. He was secretary of the convention and on the committee with Garrison to draw up the "declaration of sentiments," which was the formal opening of the war upon slavery. He represented his native town in the legislature of Massachusetts in 1835, and was reëlected, but declined to serve on account of ill health. In 1836 he sold his farm and removed with his mother and sister to Amesbury, Mass., where he resided to the close of his life. In 1838–40 he was editing the *Pennsylvania Freeman* in Philadelphia. His office was sacked and burned by a mob in May, 1838. He returned to his Amesbury home in 1840, and in addition to the spirited lyrics addressed to the conscience of the people of the U. S. in the matter of slavery, he occasionally sent out ballads, exquisitely sweet and simple, illustrating many phases of New England life and character. These ballads were collected in 1843 as "Lays of My Home," and was the first book from which he derived pecuniary benefit. He was on several occasions candidate for Congress of the Liberty Party, but declined the position in 1843, when there seemed to be a prospect of being elected. In 1846 a collection of his antislavery poems, "Voices of Freedom," was published in Philadelphia. He was corresponding editor of *The National Era*, published in Washington, for thirteen years (1847–60), contributing to it many poems and prose articles. Several volumes were compiled from these writings. When *The Atlantic Monthly* was started in 1857 he became one of its principal contributors. In 1866 was published "Snow Bound," a graphic picture of an isolated New England homestead in winter, in which are many fine touches delineating each member of the family in which his youth was spent. The great popularity of this poem gave him a pecuniary independence he had not before enjoyed.

During all his life he had a deep interest in public affairs, and took pains to make his influence felt in shaping the policy of his party. He was a member of the electoral college of Massachusetts in 1860 and 1864. He was never married.

Whit'tington, Sir Richard, abt. 1350–1423; English merchant and philanthropist; b. at Pauntley, Gloucestershire. Being obliged to seek his living, he, according to a well-known legend, walked to London and was apprenticed there to a merchant. At one time he started to run away, but while seated at the foot of Highgate Hill seemed to hear in the chime of Bow Bells,

> Turn again, Whittington,
> Thrice lord mayor of London.

Married Alice Fitzwarren, daughter of his employer; became a wealthy merchant, his first capital having been derived from the sale of a cat in an Eastern market; Lord Mayor of London, 1397, 1406, and 1419; made loans to Henry IV and Henry V; ordered the compilation of a sort of directory of the city of London, containing curious accounts of its customs. Left his large estate to public or charitable objects, among which were the rebuilding of Newgate Prison, the founding of a college and of the libraries at Guildhall and of the Grey Friars, and the repair of St. Bartholomew's Hospital. He shared with Richard Harweden the expense of rebuilding the nave of Westminster Abbey.

Whit'worth, Sir Joseph, 1803–87; English mechanic and engineer; b. Stockport, England; became a toolmaker, and 1833–54 devoted himself to the improvement and production of those machine tools which made his name known throughout the world. He was the first to make and introduce into general use standard gauges for mechanical work of such accuracy as to secure uniformity in the products of all shops using them. He also established the standard screw threads now used in Great Britain, Russia, Italy, and Germany. In 1854 he turned his attention to rifles, and in 1857 submitted for trial a small arm far superior to any then existing, and embodying the principles upon which modern improvements have been based. This rifle, after distancing all others in competition, was rejected by the British Ordnance Board as being of too small caliber. In the construction of cannon he was equally successful in his products and unsuccessful in their adoption, making in 1862 a rifled gun of high power, whose proportions were almost the same as those used to-day; but this was rejected by the ordnance board, and the progress of improvement in ordnance retarded in Great Britain nearly twenty years by the adoption of the Woolwich patterns. To secure a gun steel which would satisfy his requirements, he perfected the process of "fluid compression," now used for the highest grades of mild steel not only for guns, but also for steamers' shafts, etc. In 1869 he gave £100,000 to found scholarships (known as Whitworth scholarships) for the promotion of mechanical science, from which every year £3,000 is distributed among the young engineers of England.

Whooping (hôp'ĭng) **Cough,** or **Pertus'sis,** an infectious and epidemic disease, generally occurring but once in the life of an individual, and usually during infancy or childhood. It is characterized by paroxysms of convulsive coughing, followed by a long, ringing inspiration, whence the name. The duration of the disease varies from two to several months. Infection is most readily conveyed during the first week, but persists for nearly a month after the commencement of the whoop. The specific cause has not as yet been positively demonstrated, though it is claimed that a certain bacillus is peculiar to the disease. The simple disease is seldom fatal, but when complicated with lung disease is dangerous. No drug will stop its progress; but treatment is directed to strengthen the patient and relieve the spasms.

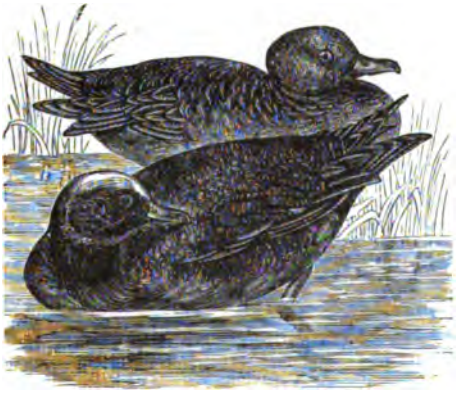
Whortleberry (hwẽr't'l-bĕr-rĭ), **Hur'tleberry,** or **Huc'kleberry,** a well-known American edible berry, being the fruit of plants of a genera of the heath family. Some of the species are known as blueberry and checkerberry in parts of the U. S. See also BILBERRY and HUCKLEBERRY.

Whyte-Mel'ville, George John. See MELVILLE, GEORGE JOHN WHYTE.

Wichita (wĭch'ĭ-tä), founded in 1870; capital of Sedgwick Co., Kan.; on both sides of the Arkansas River; 100 m. SW. of Emporia, 161 m. SW. of Topeka. It is the center of a wheat-growing and stock-raising region and a commercial shipping point. The city is laid out regularly, has a mild and healthful climate, and modern improvements. The business interests comprise stock yards and meat-packing houses and factories of agricultural implements, chemicals, flour, sashes and doors, wagons, spring beds and mattresses, brooms, hose couplers, harness, bottled goods, trunks, soap, and ice. Pop. (1906) est. at 35,541.

Wick'liffe, John. See WYCLIF.

Widg'eon, or **Wigeon,** a genus of ducks. The bill is shorter than the head, rather high, with its sides parallel nearly to its end, the end somewhat obtusely pointed, and the nail at the tip a third as broad as the bill itself; the tail is pointed and less than half the length of the wings. Four species are known, two of which are inhabitants of the N. hemisphere and two of the S. The European widgeon has the head and neck reddish brown or cinnamon. The head is diversified by cream color on the top and by green in a band around the eye, and in a few spots behind it. The American widgeon has the head and neck in the main grayish, with the feathers of the former thickly spotted, and of the latter banded with black; the head is also relieved by white on the top (whence it is sometimes called bald pate) and by green in a broad and continuous patch around and behind the eye. The species remain farther to the S. than many of their kindred, the American widgeon breeding in N. Dakota and Montana.



EUROPEAN WIDGEON.

Wid'ow. See DOWER.

Wieland (vē'länt), **Christoph Martin,** 1733–1813; German poet; b. Oberholzheim, Würtemberg; wrote Latin and German verses when twelve years old. In 1750 he went to the Univ. of Tübingen; was then a private tutor at Berne. He held an office in the civil service at Biberach (1760–69), and came in contact with the German nobility, whose life greatly influenced him. In this period he wrote "Don Sylvio de Rosalva," "Komische Erzählungen," "Agathon," all of a very captivating but rather doubtful character; the didactic poem "Musarion," very elegant in its form, and in those days startling in its ideas; and a prose translation of Shakespeare. Held the chair of philosophy at Erfurt, 1767–72. In 1772 he was called to Weimar as tutor to the young duke, and he remained there till his death. He translated Horace, Lucian, and Cicero; wrote "Oberon," his best and most celebrated work, a romantic epic. Considered simply as productions of art, Wieland's works have, with a few exceptions, lost somewhat of their interest. The frivolity of his humor, the sensuality of his imagination, are covered, but not always redeemed, by the sprightliness of his wit and the quickness and compass of his feeling. After Luther, he is the first great poet in the German literature to whom verse was a natural form of speech, and beneath the elegance and refinement of form, which he learned partly from the French and partly from the Greek, there moves in all his works a native grace, a genuine spirit of sweetness and cheerfulness. He thus made German fiction attractive to the upper classes of German society, which had hitherto neglected it, and became an important element, the model of naturalness, in the education of Goethe.

Wiertz (vērts), **Antoine Joseph,** 1806–65; Belgian painter; b. Dinant, Belgium, in humble circumstances; admitted to the art school of Antwerp, 1820; won the great prize, 1834; studied then in Rome; settled at Brussels. The first period of his career (1834–48) is characterized by colossal representations of mythological or biblical subjects—"Contending for the Body of Patroclus," 20 by 30 ft.; the "Revolt of the Angels," the "Flight from Egypt." the "Triumph of Christ," 50 by 30 feet; put his own name on a picture by Rubens, sent it to the committee of a Paris exposition, and made the unfortunate judges the laughing stock of Europe when they rejected it. In 1847 the Belgian Govt. built him a large studio, and between 1848 and 1853 he succeeded in perfecting the discovery of a new method of painting, which he called *peinture mate*, and which combines the qualities of fresco and oil painting. In the later period of his life (1853–65) he devoted himself almost wholly to quaint and gloomy subjects, and allowed the artistic qualities of his pictures to be inferior to what his great abilities might have made them. He bequeathed all his pictures to the state, and they are now exhibited in the Wiertz Museum, his former studio.

Wiesbaden (vēs-bä'dĕn), town; province of Hesse-Nassau, Prussia; at the foot of Mt. Taunus, on the Salzbach, an affluent of the Rhine. It is one of the most popular watering places of Germany. It contains fourteen hot springs. These springs, which are used in cases of gout and rheumatism, were known to the Romans (*Aquæ Mattiaceæ*), and they are now generally used by about 80,000 persons each season. Pop. (1905), 100,953.

Wig'eon. See WIDGEON.

Wig'gin, Kate Douglas. See RIGGS, KATE DOUGLAS.

Wight (wīt), **Isle of,** an island in the English Channel, belonging to the co. of Hampshire, England, from which it is separated by the roadstead of Spithead. Area, 145 sq. m. It is traversed from E. to W. by a range of chalk downs rising 600 to 700 ft., which presents a variety of fine scenery. Off the W. coast are the small chalk islands called The Needles. The soil is fertile and the climate mild and equable. Wheat, vegetables, and fruits are cultivated, and a fine breed of sheep is reared. The island is much resorted to as a bathing place and by consumptives. The island was known as Insula Vectis by the Romans, who conquered it in the reign of Vespasian, and there are many evidences of the Roman occupation. Near the town of Cowes is Osborne House, where Charles I was imprisoned for a short time, which was a favorite residence of Queen Victoria. Pop. (1901) 82,418.

Wig'wam, a N. American lodge or tent, generally of conical shape, formed of bark, mats, or hides, laid over stakes stuck in the ground and coming together at the top, where there is an opening for the escape of smoke. The Indians of the plains call these tepees. The term wigwam is also supplied in the U. S. to large structures erected for conventions or other meetings.

WIGWAM.

Wil'berforce, William, 1759-1833; English philanthropist; b. Hull; educated St. John's College, Cambridge; was a member of Parliament, 1780-1825. He is principally notable for his continued efforts against the slave trade and for negro emancipation, his work being crowned with success just before his death. Among the most important of his other philanthropic labors were his efforts in behalf of the Bible and missionary societies, for Roman Catholic emancipation, against the war with America, and for Christianizing India. ROBERT ISAAC, 1802-57, his son, a clergyman; became Archdeacon of the E. Riding of Yorkshire, but in 1854 resigned his preferments and entered the Roman Catholic Church. SAMUEL, 1805-73, brother of the preceding; b. Clapham; graduated Oriel College, Oxford, 1826; select preacher before the Univ. of Oxford, 1837 and 1845; Archdeacon of Surrey, 1839; Dean of Westminster, March, 1845; Bishop of Oxford, 1845; Bishop of Winchester, 1869. He was a leader of the High Church party, but an opponent of ritualism; was distinguished for eloquence and wit, for his efficiency as a bishop, and for his skill as a debater. The versatility of his opinions earned for him the nickname of "Soapy Sam," because, as he wittily explained, "he was always in hot water, and always came out of it with clean hands." He was author of "Notebook of a Country Clergyman," "Eucharistica," "The Rocky Island, and Other Parables," "A History of the Protestant Episcopal Church in America," etc.

Wild'cat, popular name for any one of several species of the genera *Felis* or *Lynx*. See CAT.

Wilde, Oscar Fingal O'Flahertie Wills, 1856-1900; English author; b. Dublin, Ireland; educated at Trinity College, Dublin, and at Oxford; became the apostle of the æsthetic movement; lectured on art subjects in the U. S., 1882; and in England and Paris; condemned in 1895 to penal servitude for two years for infamous conduct. Among his works are "Poems"; "The Picture of Dorian Gray," a novel; "The Happy Prince and Other Tales"; "Intentions," essays; "Lord Arthur Savile's Crime," and a number of comedies, including "Lady Windermere's Fan," "A Woman of No Importance," and "The Importance of Being Earnest," some of which are still played in England and the U. S. After his imprisonment he wrote a poem, "The Ballad of Reading Gaol," and an autobiographical work, "De Profundis."

Wil'derness, Bat'tles of the, a series of engagements in the American Civil War, May 5-26, 1864, between the Federal Army of the Potomac, under Gen. Grant, and the Confederate Army of N. Virginia, under Gen. R. E. Lee. The Wilderness is a wild tract along the S. bank of the Rapidan, in Orange and Spottsylvania cos., Va.; its length from E. to W. is about 15 m. and its breadth about 10 m. It is covered by a dense growth of scrub oak, dwarf pines, and brambles, with here and there a patch of woods or a small clearing. During the winter of 1863-64 the Confederate army had occupied a strong position S. of the Rapidan. Its effective strength at the opening of the campaign was about 60,000. The Army of the Potomac, under Gen. Meade, was joined for this campaign by the Ninth Corps, under Burnside, making Grant's total force about 130,000, of whom somewhat more than 100,000 were available for battle.

The Army of the Potomac started across the Rapidan at midnight of May 3d. The two armies came in collision in the Wilderness on the 5th, and on that day and the 6th bloody engagements were fought. The result was a drawn battle, but Grant had secured the roads by which he was to pass out of the Wilderness to the S. After dark on the 7th he put his army in motion toward Spottsylvania Court House, 15 m. SE., which Lee reached first, taking up a strong position. An attempt to dislodge him was made on the 10th, the main attack being directed against the Confederate left center, where repeated assaults were repulsed with a loss to the Federals of over 5,000 men. On the 12th Hancock stormed Lee's right center, captured 4,000 prisoners, and was repulsed from a second line, but held the first against repeated assaults. Burnside on the left and Warren on the right were both baffled in their attacks. Finding Lee's right unassailable, Grant on the 20th began to withdraw his forces, reaching the N. bank of the N. Anna on the 23d, where he was confronted by Lee on the S. bank. The wings crossed, with some fighting, but the center was driven back. In the night of the 26th the Federal army was retired to the N. side of the river, and then marched by a wide circuit E. and S. to the Pamunkey, which it crossed. Again Lee made a similar movement by a shorter line, and the next serious conflict was at Cold Harbor (see Chickahominy). The losses of the Army of the Potomac in these engagements were as follows:

Days.	Killed.	Wounded.	Missing.	Total.
May 5–12.....	3,288	19,278	6,844	29,410
May 12–21....	2,146	7,956	279	10,381
May 21–31....	150	1,130	327	1,607
Total.....	5,584	28,364	7,450	41,398

This does not include the losses in Burnside's corps. No trustworthy statement of the Confederate losses was made; they were probably about 20,000.

Wild Serv′ice. See Sorb Tree.

Wilhelmina (vĭl-hĕl-mē′nä), **Helene Pauline Marie,** 1880– ; Queen of the Netherlands; only child of King William III of Holland by Queen Emma, his second wife; b. La Haye; succeeded to the throne on the death of her father, 1890, her mother being regent. She was married to Prince Henry of Mecklenburg-Schwerin, February 7, 1901. April 13, 1909, her daughter, Juliana Wilhelmina, Princess of Orange, was born.

Wilk. See Whelk.

Wilkes, Charles, 1798–1877; explorer and rear admiral U. S. navy; b. New York. He conducted the U. S. expedition (1838–42) to explore the S. and Pacific oceans, a narrative of which he published. In 1861 he was ordered to the W. Indies in command of the frigate *San Jacinto* to search for the Confederate cruiser *Sumter*. Learning that the Confederate commissioners Slidell and Mason were on their way to Europe in the British mail steamer *Trent*, he intercepted that vessel and took from her the commissioners. In 1862 he was in command of the Potomac flotilla to coöperate with the Army of the Potomac, but on the withdrawal of that army from the Virginia peninsula was ordered to command the flying squadron organized for the purpose of breaking up blockade-running between the S. states and the W. Indies. Many captures were made. In July, 1866, he was promoted rear admiral, and soon after placed on the retired list.

Wilkes, John, 1727–97; English politician; b. London. In 1757 he entered Parliament, and in 1762 started the *North Briton* newspaper to assail the administration of Lord Bute. He was prosecuted for charging the king with falsehood, which caused a riot in his favor. His papers were seized and he was confined to the Tower, but soon released on the ground that his arrest under a general warrant was unconstitutional. In January, 1764, he was expelled from the House of Commons, and the upper house having accused him of writing "An Essay on Woman," an obscene poem, he was tried before Lord Mansfield, found guilty, and, as he had fled to France, was outlawed. He returned to England in 1768, and was again elected to Parliament for Middlesex. He was arrested, and a new riot ensued. The sentence of outlawry was reversed by Lord Mansfield; but Wilkes was convicted of two libels, fined £1,000, and sentenced to twenty-two months' imprisonment. He was again expelled from Parliament for a new libel, and while still in prison was four times reëlected, but not admitted. He was now idolized as a defender of popular rights, the cry of "Wilkes and liberty" being taken up by the people. In April, 1770, he was set at liberty and elected alderman of London. In 1771 he was elected sheriff, and in 1774 lord mayor; and in the latter year he was again elected to Parliament for Middlesex and took his seat. He was celebrated for conviviality, for his ugliness, and his wit. He published translations and editions of several classics. His "Letters to his Daughter" were printed in 1804.

Wilkesbarre (wĭlks′băr-ĭ), capital Luzerne Co., Pa.; on the Susquehanna River, 18 m. SW. of Scranton, 144 m. N. by W. of Philadelphia. The city extends N. and S. 3½ m. and E. and W. 1½ m.; is located in about the center of the Wyoming valley. Among the more notable public buildings are a fine city hall, courthouse, jail, two hospitals, three theaters, a Grand Army hall, Y. M. C. A. building, Historical Society, Osterhout Free Library, and the armory of the Ninth Regiment, N. G. P. Many of the churches are noteworthy structures. The public and parochial schools have an enrollment of over 13,000 pupils. The charitable institutions include two hospitals, home for friendless children, and home for aged women. There are large lace factories, a silk mill, foundries, axle works, engine shops, wire rope works, cutlery works, immense breweries, and many factories of iron, steel, wood, and leather. The mining and preparing of anthracite coal, the business center of which is in the city, makes the greatest demand for labor, and is the foundation of the city's wealth, giving employment to about 40,000 men and boys. The total annual output of coal here is 15,000,000 tons. The city as well as the whole valley of Wyoming is underlain with seams of anthracite coal of an average aggregate thickness of 56 ft. Wilkesbarre was settled mainly by people from Connecticut in 1769, incorporated as a borough in 1806, and chartered as a city 1871. Pop. (1906) est. at 60,121, and including the near-by boroughs, all connected by steam and electric railroads, about 150,000.

Wil'kie, Sir David, 1785–1841; English painter; b. Cults, Fifeshire, Scotland; studied painting in the Trustees' Academy, Edinburgh, and at the Royal Academy, London, where in 1806 he exhibited his "Village Politicians," quickly followed by "The Blind Fiddler," "The Card Players," "Rent Day," and "Village Festival," which obtained him great popularity; produced many notable pictures, including a group of "Sir Walter Scott and his Family" and the "Chelsea Pensioners Reading the Gazette of the Battle of Waterloo," executed for the Duke of Wellington, generally considered the most perfect representative of his genius. Subsequently he changed his style, sought to emulate the depth and richness of the coloring of the old masters, and chose elevated, and even heroic, subjects, to the height of which he could never fully raise himself. He spent three years (1825–28) on the Continent on account of ill health, visiting Italy and Spain. He was made painter in ordinary to George IV, January, 1830; was knighted by William IV, 1836; made portraits of those sovereigns and of Queen Victoria; executed a fine painting of the "first Council of Queen Victoria"; visited Palestine and Egypt in 1840.

Wil'kinson, James, 1757–1825; American soldier; b. Maryland. He became brigadier general in 1792 and general in chief in 1796. He was Governor of Louisiana 1805–6, and was employed to defeat the plans of Aaron Burr. On charges of complicity with Burr and receiving bribes from Spain he was tried and acquitted in 1811. In 1813 he reduced Mobile, and was then ordered to the N. frontier. His operations against Canada were totally unsuccessful, but he was acquitted of blame. He spent his later years in Mexico.

Will, The, one of the three faculties of the mind, the two others being intellect or thought, and emotion or feeling. The will decides which course of action shall be taken, and the process of choice is called volition. It begins in early childhood as a choice between muscular motions, urged by pleasure and restrained by pain, and guided by the approval or rebuke of others. As the mind becomes more mature, the interplay of motives becomes more complex, and choice is then made not always from considerations of present pain or pleasure, but often upon the general ideas formed by teaching and experience which we call duty, conscience, prudence, etc., the combined influence of which in each individual is called character. This character, strengthened or weakened by heredity, training, and surroundings, gives color to all the thoughts and determines what weight shall be given to the various motives presented to the mind. The building up of the will, the instilling of right fixed principles of thought and action, and encouraging the habit of self-control, are results of education more important than the routine acquisition of knowledge.

One of the highest functions of the will, and one which develops latest, is the power of inhibition or the refusal to give way to the various chains of thoughts and feelings which continually thrust themselves into consciousness, and the ability to concentrate all the mental energy upon one particular object or end. This is the culmination of character—self-possession, or self-control. A child or young person, urged by a spontaneous exuberance of life, will entertain a perpetual succession of dreams and reveries, and the attention will be turned by any passing object or fancy. But as the habit of concentration becomes developed, the mental and physical life become more orderly, and power is not frittered away upon useless thoughts or objects. The aim of education is to establish a rational balance of motives, so as to permit the enjoyment of pleasure without neglect of duty.

The cultivation of the will should in the early stages of childhood be encouraged by an uninterrupted series of easy successes. Discouragement and failure should be avoided. Too much should not be attempted at once, but fixed habits should be gradually formed. Outbreaks of passion or feeling should be controlled, as the emotional development of the child will influence not only its health, but, later, its success and happiness. Day dreaming and mind wandering must be discouraged by cultivating habits of mental concentration. Mathematics and the practice of intelligent memorizing are good aids to a proper control of the attention.

Stubbornness, based upon one fixed idea to the exclusion of others, does not indicate strength of will any more than early smartness foreshadows later intellectual superiority. For the natural brilliancy of the bright child or the spoiled darling that has been allowed to have its own way will be no match in later life against the patient steadiness of the trained plodder who, although less gifted by nature, has been schooled to utilize all his energies upon the task in hand. See FREE WILL.

Will, or Last Will, or Tes'tament, in law, the written instrument wherein a man declares his wishes in respect to the disposition of his property after his death. Technically, a will disposes of real estate; a testament relates to personal property. The general rule is, that all persons having property may dispose of it by will. The exceptions relate principally to infants, persons of insufficient mind, and married women. At common law infants could not dispose by will of real estate, though males of fourteen and females of twelve might dispose of personality; but by statute 1 Victoria, ch. 26, no will made by any person under twenty-one is valid. The common-law rule is variously modified in the different states of the Union. What incapacity of mind invalidates a will is among the most difficult and most contested questions of law. A married woman cannot, by common law, make any will whatever except with the husband's assent; but this rule has received much modification in England, and more in the U. S., in many of which she is allowed all the power which may be exercised by any other person. No special form of words is necessary to constitute a will or legacy. It is enough if the language convey with distinctness the intention and desire of the testator.

As to the execution and attestation of wills, the law is stringent. The provisions of the statute of frauds are generally adopted in the U. S. The will must be declared to be the will, and signed in presence of two witnesses, and in many of the states of three—preferably in the presence of each other; but sometimes exception is made where the will is wholly in the handwriting of the testator. But a seaman or soldier may make a will without the usual formalities, even in some cases by mere word of mouth. A seal, unless required by statute, is not necessary to the validity of the will. Against the name of every witness his residence or address should be written as a convenience, where it is not required by law. The attestation must (with the exception of a few states) be in the presence of the testator, who must have sufficient possession of his senses to know and understand the act of attestation. Under some statutes the testator must declare the instruments to be his will, or in some way inform the witnesses of this fact, when they attest it. An addition to a will is called a codicil. As to revocation, the common-law rule was that a marriage and the birth of a child after the execution of a will revoked it; and this rule has much force in this country now, although it is variously modified by statute. The most certain way to revoke a will is to utterly burn or otherwise destroy it, for the loss or destruction of a later will revives a former will if in existence undestroyed. The most notable principle in the construction of a will is to give effect to the intentions of the testator, disregarding so far as may be necessary any mere technical rules, such as are sometimes applied to other instruments. See ADMINISTRATION; DESCENT; EXECUTOR; LETTERS TESTAMENTARY; PROBATE.

Willa'mette Riv'er, a branch of the Columbia; rises in the Cascade Mountains in Oregon, and flows first NW. and then N. through a beautiful region, extremely fertile and now well settled. It is navigable to Portland, 15 m.; 25 m. from its mouth are the Willamette Falls, at Oregon City. The river here falls 40 ft. perpendicularly, but a canal and locks enable small steamboats, for two thirds of the year, to pass up to Eugene City, more than 130 m.

Wil'lard, Frances Elizabeth, 1839-98; American temperance advocate; b. near Rochester, N. Y.; graduated at the Northwestern Female College, Evanston, Ill., 1858; was a teacher in W. towns; director of the Genesee Wesleyan Seminary, Lima, N. Y., 1866-67; in 1871-74 was Prof. of Æsthetics in Northwestern Univ., and dean of the Woman's College connected with it. She was the author of "Nineteen Beautiful Years," a biographical sketch of a deceased sister; "Glimpses of Fifty Years," "A Great Mother," etc. She became president of the Woman's Christian Temperance Union in 1879; founded the World's Woman's Christian Temperance Union in 1883, and was president of the same, 1888-98. She was editor in chief of *The Union Signal,* the official organ of the White Ribbon movement.

Will'iam, the name of four kings of England. WILLIAM I (THE CONQUEROR), 1027-1087; b. Falaise, Normandy, the bastard son of Robert the Devil, Duke of Normandy, by Arletta, a tanner's daughter of Falaise; educated at the court of Henry I of France; succeeded by his aid to the ducal throne of Normandy in 1035, and married, 1053, Matilda, daughter of Count Baldwin V of Flanders. As the English king, Edward the Confessor, had no children, William laid claim to the succession, his grandmother Emma being a sister to Edward. It is said that the king himself acknowledged the claim, and William maintained that Harold had pledged himself in 1064 that he would not oppose his succession. Nevertheless, when Edward died (January 5, 1066), Harold was elected king. The Norman duke thereupon formed an alliance with Tostig, Harold's banished brother, and, having secured from Pope Alexander II a declaration that his claim was just, landed at Pevensey, September 29th. On October 14th was fought the battle of Hastings or Senlac between William and Harold; the Anglo-Saxons were routed, Harold fell, and, December 25th, William was crowned King of England at Westminster. His government was at first conciliatory, but as one insurrection followed another, and found support both from the Scots and the Danes, he adopted severe measures. With the capture of Ely (1071), where Hereward had kept up an obstinate resistance to the invaders, the conquest of England was complete, and in 1072 William subdued the Scottish king, Malcolm III. The whole country between the Tees and the Humber was laid waste. The estates of the fallen or banished Saxon nobles were partitioned out to the Norman lords; but, in order to prevent the concentration of too much power in the hands of a vassal, care was taken that the lands thus bestowed should not be contiguous. A network of military stations was spread over the whole country—strongly fortified castles, from which the feudal Norman kept the Saxon population in submission. In 1068 the curfew bell was introduced, at the sound of which every light and fire in the country should be extinguished, and between 1080 and 1086 a survey was taken—the so-called Domesday Book. The landholders were obliged to swear fealty to the king, who, while retaining the forms of feudalism, exalted the royal authority and laid the foundation of a strong kingship, in contrast to the feebleness that characterized the feudal monarchies of the Continent. The great positions were filled by Normans, while the native population made up the lower orders in the feudal scale. Though a harsh ruler, he administered a rude kind of justice. As the Anglo-Saxon Chronicle says, "He would permit no plunder save his own." In a campaign against France he was injured by a fall from his horse at Mantes-sur-Seine. He was brought to Rouen, and died there.

William II, **Rufus**, 1056–1100; b. Normandy; son of William the Conqueror; educated in England by Lanfranc, and succeeded to the throne on the death of his father, while his elder brother, Robert, took possession of Normandy. He was (1088) involved in war with the partisans of his brother in England, who were, however, soon put down. Two years later he carried the war into Normandy, and forced his brother to consent to humiliating terms of peace. He also waged war with Scotland, invaded Normandy a second time in 1094, quarreled with the King of France, and attempted to conquer the Welsh. He came into possession of Normandy when, in 1096, Robert mortgaged the country to him on setting out for the Holy Land. He was planning to secure Aquitaine, but before he could take possession he was shot by Walter Tyrrel, or Tirel, while hunting in the New Forest, August 2, 1100. He built London Bridge, and completed London Tower and Westminster Hall.

William III, 1650–1702; King of Great Britain and Ireland, and stadtholder of the Netherlands (1672–1702); son of William II, Prince of Orange and stadtholder of the Netherlands, and Mary, eldest daughter of Charles I of England; b. The Hague. Louis XIV took possession of the family estate of Orange; Oliver Cromwell persecuted him as a Stuart, and in the Netherlands, where his father had exerted himself to make the stadtholdership hereditary in the family of Orange, Jan de Witt carried through a law which prevented any person from being at the same time stadtholder and commander in chief of the military forces of the republic. Nevertheless, in 1672, when France and England attacked the Netherlands, and Jan de Witt had been murdered, William was made stadtholder and commander in chief, and by his military and diplomatic talents he freed the country from the grasp of Louis XIV. He succeeded in detaching England from France, and the Peace of Nymwegen (1678) was at least honorable to the republic. In 1677 he married his cousin Mary, eldest daughter of James, Duke of York, and heir presumptive to the English crown, and in the contest between the king and the people, which became almost desperate, he became the center of the opposition. In 1688 he was invited by the most prominent men in England to interfere, and on November 5th of the same year he landed at Torbay with 15,000 men. James fled to France, deserted by all, and on February 13, 1689, was deposed by Parliament, and William and Mary were established on the throne. James afterwards went to Ireland, where the Roman Catholic population rose in favor of him, but he was completely defeated in the battle of the Boyne, and all Jacobite movements were suppressed. In December, 1689, England joined the Grand Alliance against France, which William had formed between Austria, Spain, and the Netherlands. From 1691 William himself commanded the allied army in the Netherlands, and, although he was defeated at Steenkerke (August 4, 1692) and at Neerwinden (July 19, 1693), he nevertheless prevented France from making any progress. At La Hogue the French fleet was nearly annihilated in 1692, and by the Peace of Ryswick (1697), England and the Netherlands lost nothing, and France was utterly exhausted. Louis XIV, however, had by no means given up his ambitious plans, and England had just determined and publicly announced that it would take part in the Spanish War of Succession when William died. In England he was not loved, and his position was often very difficult, especially after the death of Mary (1694). He was destitute of those small arts by which a man in a superior position so easily wins the confidence, good will, and enthusiasm of his inferiors; but the soundness and elevation of his political views, and the sagacity and self-sacrificing energy with which he carried them out, have probably never been doubted. His great task was to resist Louis XIV, and in him political absolutism and religious intolerance; and he fulfilled it.

William IV, 1765–1837; King of Great Britain, Ireland, and Hanover; b. London; third son of George III; educated for the navy; lieutenant, 1785; admiral, 1801, and lord high admiral, 1827; created Duke of Clarence, 1789; became heir presumptive to the crown in 1827, and succeeded, June 26, 1830. The chief event of his brief reign was the movement for parliamentary reform, secured by the Reform Act of 1832. Though he had professed to be a Whig, and in favor of liberal measures, his blundering and irresolute conduct obstructed the much-needed reform, and by prolonging the crisis exasperated the people. He was succeeded in Hanover by his brother, and in England by his niece, Victoria.

William, the name of three kings of the Netherlands, descending from the brother of William the Silent of Orange-Nassau. **William** I, 1772–1843; b. The Hague. When the National Convention of France declared war against the republic (1793), William assumed the command of the Dutch army, but on January 18, 1795, he embarked with his father and the rest of the family at Scheveningen, and went to England. On his father's death (April 9, 1806), he came into possession of the hereditary estates of the family, Nassau-Dietz, but, having allied himself with Prussia and accepted a command in the Prussian army, he was taken prisoner at Jena, and all his possessions were confiscated by Napoleon. He was soon released, and fought against the French at Wagram, but lived in retirement at Berlin until after the battle of Leipzig. The Hollanders now rose against the French, and, in 1813, William landed at Scheveningen, and was hailed by the people as their sovereign. By the Congress of Vienna the Kingdom of the Netherlands, consisting of Holland and Belgium, was formed, and on March 16, 1815, William I was proclaimed king. In compensation for his hereditary possessions, which were given partly to Prussia, partly to Nassau, he received the grand duchy of Luxemburg. The combination of Holland and Belgium proved a blunder. By the Revolution of 1830, Belgium seceded, and was recognized as an independent kingdom, December 20, 1830. William I, however, would not submit to this decision, but continued his protest and resistance up to 1839 in a foolish manner. This and other circumstances made him unpopular, and on October 7, 1840, he found it advisable to abdicate in favor of his son. He went to Berlin with an enormous fortune, and died there. William II, 1792–1849; b. The Hague; eldest son of William I; served in the Spanish and British armies against the French, and distinguished himself at Quatre-Bras and Waterloo, where he was wounded. He restored order to the finances, but was unwilling to enter on any political reforms. Nevertheless, when in 1848 the fermentation became dangerous in the country, he consented to a thorough reorganization of the government, but died before the new constitution could be established. William III, 1817–90; b. The Hague; son of William II; succeeded to the throne, March 17, 1849. When the German union was dissolved in 1866, he succeeded in separating Limburg and Luxemburg from Germany, and annexed the former to the Netherlands. Concerning the latter, negotiations were opened by Napoleon III, who wanted to buy it, but these negotiations were frustrated by Bismarck, and Luxemburg was declared neutral. Though licentious in his private life, he was a politic and progressive ruler, and in internal affairs his government was very successful. In 1879 he married the Princess Emma of Waldeck-Pyrmont, by whom he had two daughters, the elder of whom is now (1910) Queen Wilhelmina.

William I, 1797–1888; Emperor of Germany and King of Prussia; b. Berlin; son of King Frederick William III and Queen Luise. He grew up with the humiliating impressions of the defeat of Jena, but distinguished himself in the campaigns of 1813–14 against France. He was an enthusiastic soldier, indefatigable in military service. When his father died (1840), and his elder brother, Frederick William IV, became king, he received the title of Prince of Prussia as heir presumptive, but for many years was not prominent in political affairs. He was considered an absolutist, and for this, as well as for his military inclinations, he was unpopular. During the revolution in 1848 he went to England. On his return he entered the Prussian national assembly as member for Wirsitz, and declared himself in favor of constitutional government. In 1849 he took command of the force against the S. German insurgents, and suppressed the revolution in the Palatinate and Baden. Later, when the supremacy of the Austrian policy in German affairs was felt with regret in Prussia, people began to look at the firmness of his character as a support of the greatness of Prussia. He was nevertheless by no means popular, and, when he became king in 1861, the reorganization of the army aroused the bitterest opposition. There followed the "Conflict Time," in which neither the king nor his opponents in the Prussian chamber would give way, and the former, in order to carry out the scheme of military reform, was obliged to rely on the upper house for supplies in direct opposition to the spirit of the constitution; but the resolution and energy of Bismarck won, and the reorganization was effected. In the war with Denmark (1864) the army proved effective, and the king began to be popular. This change was more apparent in 1866, when, under the personal leadership of the king, brilliant victories were won over Austria and her German allies. In 1867, William placed himself at the head of the newly formed N. German union.

But the greatest glory was gained by the king in the war with France (1870–71). The refusal of Napoleon III's demand for territory on the Rhine and the thwarting of his designs on Belgium and Luxemburg had made war probable, and all measures were taken to insure success when the conflict came. The war was desired by the king and Bismarck as the means of strengthening Prussia and attaining German unity. Napoleon's folly in the matter of Prince Leopold of Hohenzollern's candidacy for the Spanish throne offered an opportunity of refusing his demands and making him appear as an aggressor. In the negotiations with the French ambassador, Benedetti, in Ems, July, 1870, the king's presence of mind, courage, and dignity won general admiration, and the enthusiasm for him increased every day as the German army pushed farther into France and gained one victory after another. Moved partly by the brilliancy of the victory, partly by the personality of the victor, the German princes, so long divided, finally agreed in offering the imperial crown of Germany to King William, and he accepted it at Versailles, January 18, 1871. The internal state of Germany, especially on the ecclesiastical field, needed a development in a liberal direction, and the policy of Bismarck soon brought about a conflict with the Roman Curia. (See Kulturkampf and Falk Laws.) The next difficulty to be dealt with was the socialist agitation. Two attempts on the emperor's life influenced the Reichstag to pass Bismarck's antisocialist law, which expired in 1881, but which has been several times renewed. Despite this repressive policy the Social-Democratic party increased in strength, and the emperor and Bismarck competed for the favor of the laboring man by a plan of social reform based on state socialism. In his foreign policy the emperor determined to keep what had been gained from France, but to avoid war. To insure peace he endeavored to make Germany so strong that none dare attack her. To guard against a combined attack from Russia and France, he formed a military alliance with Austria-Hungary and Italy, the *Dreibund*.

William II, 1859– ; German emperor and King of Prussia; eldest son of Frederick, second German emperor and eighth King of Prussia. He received a thorough military training and instruction in administrative methods. On the death of his father, June 15, 1888, he became emperor, and early showed himself a resolute upholder of the traditional rights and dignity of his office. His speeches inspired the fear that his policy would be reactionary, his tone being that of a monarch convinced of his divine right. He was soon at variance with Bismarck, who, finding himself unable to retain his influence, resigned in 1890.

Some of the important features of the reign are the strengthening and renewal of the Triple Alliance, the legislation in favor of the workingman, and the cession to Germany of Heligoland. William II married, 1881, Princess Victoria of Schleswig-Holstein-Augustenberg.

William of Nas'sau, sometimes called WILLIAM OF ORANGE, or WILLIAM THE SILENT, 1533-84; b. Dillenburg, Nassau; eldest son of Count William of Nassau-Dillenburg. In 1544 he inherited the principality of Orange in Provence, whence he derived the title of Prince of Orange, and estates in the Low Countries, and he was sent to Brussels, where he was educated in the Roman Catholic faith. When he was fifteen he became a page to Charles V, who employed him, while still a young man, in the highest military and diplomatic positions, and on his abdication (1555) recommended him in the strongest terms to his son and successor. In the beginning Philip II also seemed inclined, if not to put confidence in him, at least to use him. He held high offices in the provinces; he negotiated the preliminary arrangements for the Peace of Cateau-Cambrésis in 1559, and he was one of the four hostages—the Duke of Alva was another—whom Spain sent to France as a guaranty of the treaty. While there the French king, Henry II, one day told him that there existed a secret treaty between him and Philip II to destroy all Protestants within their dominions; but, although this communication must have shocked and angered him, such was his self-possession that the news was received as carelessly as it was given. His discretion on this occasion earned for him the sobriquet of "The Silent," which, however, in nowise applies to his general character, for in his usual bearing he was frank and cordial. As a young man he kept a magnificent household.

Soon, however, after his conversation with Henry II, he found other use for his money, for he rose immediately in opposition to Philip II, and never, as long as he lived, gave up his resistance. As Governor of Holland and Zealand he refused, in 1564, to allow the Spanish Inquisition in these provinces. When, finally, Philip II decided to send the Duke of Alva as Governor General to the Netherlands with a large Spanish army, William resigned all his offices and retired with his family to Germany. As soon as Alva arrived, arbitrary measures for the religious and political suppression were carried out, often with atrocity. William was summoned to appear before the council which had condemned Egmont and Horn, and his eldest son, a boy of thirteen years, was seized and carried to Spain, where he was held for twenty-eight years. In 1568 he raised an army by his own funds, and invaded the country, but, although he gained some advantages, he was unable either to rouse the population to a general revolt or to bring Alva to a decisive battle; and he was compelled to disband his army. In 1572 he made a new attempt, and with greater effect. In 1570 he had issued letters of marque to privateers, and these "Beggars of the Sea" inflicted great damages on Spanish commerce, especially since they (1572) had come into possession of Briel and Flushing, which formed a solid basis for their operations. Thus war with Spain appeared to be a remunerative trade, while obedience had proved to be ruin, so, on the approach of William with a new army, Holland rose in rebellion, and its states chose William stadtholder in 1572; and although William, failing to obtain aid from the French, was again compelled to disband his army, war began to be carried on in a regular manner against the Spaniards.

The military successes which the Hollanders achieved were not remarkable, but the heroism of the people was displayed on many occasions, as in the defense of Leyden. It soon became apparent that the provinces under Spanish rule were impoverished, while the provinces under William's administration prospered. By degrees the hatred to the Spaniards spread throughout the S. provinces, even among the Roman Catholics, and in October, 1576, William brought about the "Pacification of Ghent," by which all the provinces united to drive the foreign soldiers out of the country and establish religious toleration. The S. provinces, however, soon separated from the league, and returned under the Spanish rule. In January 23, 1579, was signed the "Union of Utrecht," by which Philip II was deposed. In 1580, Philip II put a price of 25,000 crowns on William's head, and, after several attempts which failed, one Balthazar Gérard finally succeeded in shooting him at Delft.

William of Or'ange. See WILLIAM III of England.

William of Wykeham (wĭk'ăm), 1324-1404; English statesman. In 1364 Edward III made him Keeper of the Privy Seal, and in 1366 Secretary of State and Bishop of Winchester. He was Lord High Chancellor of England, 1367-71. Charges were made against him in 1376 of misappropriations of money, and he was banished from his see, but was restored by Richard II. He was again created Lord High Chancellor in 1389, but resigned, 1391. He was the virtual architect of Windsor Castle, and founded colleges at Winchester and Oxford.

Will'iams, Roger, 1607-83; founder of the colony of Rhode Island; b. London, England. He was a clergyman of the Church of England, and became a Puritan of the extreme wing. Arriving at Boston, February 5, 1631, he soon incurred the hostility of the authorities, chiefly by denying that the magistrates had a right to punish for any but civil offenses, and shortly went to Salem to help Pastor Skelton. Before the close of summer persecution obliged him to retire to Plymouth, where for two years he was assistant of the pastor, Ralph Smith. Here he formed the acquaintance of leading Indian chiefs, and learned their language. He was invited to return to Salem, and became the assistant and then the successor of Skelton. In 1635 the general court banished him, ordering him to depart within six weeks. In midwinter, abandoning his friends and his family, he traveled through the wilderness to the shores of the Narragansett. After purchasing lands of Ousamequin on the E. shore of the Seekonk River, and planting his corn, he learned that he was within the bounds of Plymouth colony, and set out with five companions on new explorations. In a canoe they went down the stream, turned the extremity of the peninsula, and ascended the river which forms its W. boundary to a spot which tradition has consecrated as their landing. Here he founded a settlement, which he called Providence, based on a written agreement providing a purely democratic government, to which only civil affairs were subjected, and organized a Baptist church.

The history of Roger Williams for the succeeding half century is the history of Providence and of Rhode Island. In 1643 he was sent to England to procure a charter, was successful, and returned in 1644. On his voyage to England he wrote his "Key into the Languages of America," including observations on the manners, habits, laws, and religion of the Indian tribes. He also published there "The Bloudy Tenent of Persecution for Cause of Conscience." He was again in England as agent of the colony, 1651–54, and published several other works there. What immortalizes Roger Williams and gives him a high place among the greatest characters of history is that, in spite of towering difficulties, he founded a state—the first in history—which was creedless itself, while welcoming and protecting all creeds whatsoever, thus giving to the principle of separation between Church and State that lodgment in American public law which led later to its adoption into the Constitution.

Williams, William, 1731–1811; a signer of the Declaration of Independence; b. Connecticut. He was an active member of the Council of Safety and of the Continental Congress, 1775–77 and 1783–84. He served nearly fifty years in the state legislature, and took part in the state convention which adopted the Federal Constitution, and expended nearly his entire fortune in the patriot cause.

Will'iamsburg, capital James City Co., Va.; 3 m. N. of the James River, 50 m. SE. of Richmond. It is on an elevated plateau between the James and York rivers, about equidistant from either stream; first settled in 1632; the oldest incorporated city in the state, and abounds in historic interest. Prior to the Revolution it was the seat of the royal government, and then, until 1779, the capital of the state. The capitol was destroyed by fire in 1748, and rebuilt; the latter building was also burned abt. 1830. Williamsburg is the seat of William and Mary College; pop. (1900) 2,044. A battle was fought here between Gen. McClellan and the Confederates, May 5, 1862. See CHICKAHOMINY.

Will'iamsport (chartered as a city in 1866), capital of Lycoming Co., Pa., since 1795 (settled in 1779); on the Susquehanna River; 96 m. N. of Harrisburg, 202 m. NW. of Philadelphia. It is built on a plain along the river at the base of hills. The city has three public parks, two race courses, Dickinson Seminary, City Hospital, City Mission, Women's Christian Home, Girls' Industrial Home, Young Men's Christian Association, and public library. It derives its prosperity from its lumber manufactures and diversified industries. The Susquehanna boom, which cost over $1,000,000, is located here, and catches all logs cut from the vast forests of pine and hemlock on the W. branch of the river and its tributaries. There are about thirty sawmills, and lumber works, silk mill, sewing-machine works, iron furnace, soap, paint, glue, and wagon factories. Pop. (1910) est. at 40,000.

Wil'lis, Nathaniel Parker, 1806–67; American author; b. Portland, Me. While in Yale he published a series of "Scripture Sketches" in verse, and other poems. In 1828 he established the *American Monthly Magazine,* which was merged in the New York *Mirror,* established by George P. Morris, of which he became associate editor. He traveled in Europe and Asia, and lived several years in England, writing for the magazines and publishing several of his works there. In 1844 he established with Mr. Morris the daily New York *Evening Mirror,* and in 1846 the weekly *Home Journal,* to which he contributed till his death. His works include volumes of poems, stories, and sketches, and for many years he was the most brilliant and popular magazine writer in America.

Will'-o'-the-Wisp. See IGNIS FATUUS.

Wil'low, any tree or shrub of the genus *Salix,* of which there are over 160 species. They grow usually in moist soil. Their flowers are in catkins, which, from their long covering of hairs, are known as pussy willows. Many of the long-leaved shrubby sorts are used in basket making, and the larger, short-leaved kinds, called *sallows* in England, are in Europe raised for hoop poles; for charcoal, to be used in gunpowder; for fence poles, which, when peeled and dried, are very durable; for vine props, hoe handles, and the like. Willow wood is also used for steamboat paddles, cricket bats, and surgeons' splints. It is light, tough, and stands exposure in water. Salicine, an active principle from willow bark, is useful in medicine. The weeping willow, a native of

WEEPING WILLOW.

China, has long been an emblem of grief. It is much planted as an ornamental tree. There are about 100 species of willow in N. America.

Wil'mington, capital of New Castle Co., Del.; on the Delaware River at the junction of its affluents, the Christiana and Brandywine rivers; 28 m. SW. of Philadelphia, 70 m. NE. of Baltimore. The city is built mainly on elevated ground, and extends from the river about 4 m. back. The city owns five parks (area, 260 acres) and several squares. Among its public buildings are a U. S. Govt. building, county courthouse, city hall, U. S. customhouse, four public libraries, auditorium, and Delaware Historical Association Hall, the latter over one hundred years old. There are over eighty churches, the Methodist Episcopal being the prevailing denomination. The most prominent charitable and reformatory institutions are the Ferris Reform School for Boys, Girls' Industrial School, Home for Friendless Children, homes for aged men and women, and three hospitals. The Delaware State Hospital for the Insane is at Farnhurst, 2 m. S. The Brandywine within 4 m. from its mouth has a fall of 120 ft., and furnishes water power for many factories, including morocco factories, carriage factories, paper mills, Du Pont's powder mills, shipbuilding yards, car-building works, ironworks, cotton factories, hard-fiber works, glass works, phosphate factory, flour mills, hosiery factories, terra-cotta works, dental factory, surgical-instrument factory, wire-cable mill, chemical works, Pullman palace-car works, cigar factories, silk mill, rolling mills, shirt factories, shoe factories, breweries, and a large steel plant. There are numerous brick yards in the city.

The origin of the city was the building of Fort Christina by the Swedes in 1638. The Dutch captured this fort in 1655, and changed the name to Fort Altena, and the town under direction of Gov. Beekman became Christinaham. In 1731 the village of Willingtown, named after Thomas Willing, was begun. The name was afterwards changed to Wilmington. The first borough election was held September 8, 1740; the first townhall was built in 1774; and a city charter was granted in 1832. Pop. (1910) est. at 95,000.

Wilmington, capital of New Hanover Co., N. C.; on the Cape Fear River; 88 m. SW. of Newbern, 214 m. NE. of Charleston, S. C. It is 26 m. above the mouth of the river and 8 m. from the Atlantic Ocean, and is on a peninsula between the river and the ocean. The city is built along 2½ m. of the river front and extends back a mile. The principal streets are 99 ft. wide, the others 66 ft. The surface is an elevated sand ridge, fairly well drained. Among the noteworthy buildings are the city hall, courthouse, U. S. Govt. building, U. S. Marine Hospital, James Walker Memorial Hospital, Masonic Temple, Elks' Temple, the armory of the Wilmington Light Infantry, First Baptist Church, Fifth Street Methodist Episcopal Church, Grace Church, St. John's Protestant Episcopal Church, Young Men's Christian Association, and the public schools.

The value of church property is over $500,000. The educational institutions include three public schools for white pupils and three for colored, with nearly 4,000 white pupils and nearly 4,500 colored; and private and parochial schools. A bureau of associated charities, a united charities (colored), and a ladies' benevolent society look after the needy, and a county home, a county house of correction, a seamen's friend society, and the Catherine Kennedy Home for Elderly Women take charge of special cases. The principal business interests are the exportation of naval stores, cotton, lumber, and rice; truck farming; and the manufacture of cotton goods, fertilizers, cotton-seed oil, turpentine, spirits and oil from pine, saw and lumber mill products, and lampblack.

The city was settled in 1730–31 under the name of Newton; was incorporated under its present name in 1739; and chartered as a city, 1866. The first newspaper was issued September 1, 1764, and the first overt act of rebellion against British authority occurred in 1765, when the citizens refused to permit the landing of stamps brought in a man-of-war. On July 18, 1775, the militia under Col. John Ashe, who led the antistamp party, captured Fort Johnson, at the mouth of the river, and forced the royal governor to flee. On the secession of N. Carolina in 1861 Forts Johnson and Caswell were occupied by state troops. During the war many cargoes were run into Wilmington through the Federal blockading fleet, nearly 300 foreign steamships making the entrance safely with cargoes in the two years 1863–64 (see FORT FISHER). Pop. (1906) est. at 21,528.

Wil'mot, David, 1814–68; American jurist; b. Bethany, Pa.; educated at the academies of Bethany and of Aurora, N. Y.; admitted to the bar and began practice at Wilkes-Barre, Pa., 1834; removed to Towanda; sat in Congress as a Democrat, 1845–51, and moved on August 8, 1846, an amendment to a bill appropriating $2,000,000 for the purchase of Mexican territory, which became celebrated under the name "the Wilmot Proviso"—"That, as an express and fundamental condition to the acquisition of any territory from the Republic of Mexico by the U. S., . . . neither slavery nor involuntary servitude shall ever exist in any part of the said territory." This proviso was adopted by the House, but rejected by the Senate, and became the starting point for the "Free-soil" movement of 1848. Mr. Wilmot was president judge of the Thirteenth District of Pennsylvania, 1853–61; delegate to the Republican National conventions, 1856 and 1860; an unsuccessful candidate for Governor of Pennsylvania, 1857; U. S. Senator to fill a vacancy, 1861–63, and judge of the U. S. Court of Claims, 1863.

Wilmot Provi'so. See WILMOT, DAVID.

Wil'son, Alexander, 1766–1813; American ornithologist; b. Paisley, Scotland. He was a weaver and peddler. Having been punished for a lampoon at Paisley, he immigrated to Delaware in 1794, then settled in Pennsylvania. In 1804 he made his first ornithological excursion to Niagara Falls, through the then unopened wilderness of W. New York, and afterwards explored other regions. The first volume of his ornithology appeared in 1808, and the work was continued after his death by George Dod and Charles Lucien Bonaparte.

Wilson, Henry, 1812-75; American statesman; b. Farmington, N. H. In 1836 he visited Washington, where his first sight of the slave trade made him resolve to devote his life to emancipation. In 1840 he was elected to the state legislature; in 1844 and 1845 to the state senate; in 1848 to the National Convention of the Whig Party. In this body, on the nomination of Gen. Taylor on a platform unpledged against slavery extension, he renounced the Whig Party and supported the Free Soil organization. In 1850 he was again elected to the state senate, and was its president. He failed of election as governor in 1853, but was chosen a U. S. Senator in 1855. During the Civil War he was associated with important legislation, and especially as chairman of the Committee on Military Affairs. In 1872 he was elected Vice President of the U. S. In the last years of his life he prepared his great work, "The Rise and Fall of the Slave Power."

Wilson, James, 1742-98; a signer of the Declaration of Independence; b. Scotland. He became a lawyer in Philadelphia, and served several terms in the Continental Congress. He was a member of the Federal constitutional convention, and advocated a strong central government. He was one of the first judges of the Supreme Court of the U. S. In 1790 he became first Prof. of Law in the College of Philadelphia. He was one of the most eminent political thinkers of his age.

Wilson, John (pseudonym, CHRISTOPHER NORTH), 1785-1854; Scotch author and educator; b. Paisley, Scotland; studied at Univ. of Glasgow and at Magdalen College, Oxford, where he won the Newdigate prize for English poetry, and graduated 1807. In 1808 he bought the estate of Elleray, in Westmoreland, where he lived in intercourse with Wordsworth, Coleridge, and Southey, and published in 1812 the poem "The Isle of Palms." In 1815 he removed to Edinburgh, and was admitted to the bar; published in 1816 the dramatic poem "The City of the Plague"; became one of the chief contributors to *Blackwood's Magazine*; Prof. of Morals, 1820, Univ. of Edinburgh. He published "Lights and Shadows of Scottish Life," "The Trials of Margaret Lindsay," "The Foresters," and "Essay on the Genius and Character of Burns"; but his most popular productions were his contributions to *Blackwood's Magazine* under the pseudonym of "Christopher North"; "Noctes Ambrosanæ," imaginary dialogues at Ambrose's Tavern, in Edinburgh, between the leading contributors to *Blackwood*; "Dies Boreales, or Christopher Under Canvas."

Win'chell, Alexander, 1824-91; American geologist; b. at North East, N. Y.; graduated at the Wesleyan Univ., 1847; teacher, 1847-53; Prof. of Physics and Civil Engineering at the Univ. of Michigan, 1853, and of Geology, Zoology, and Botany, 1855; state geologist of Michigan, 1859-62; Prof. of Geology in the Kentucky Univ., 1866-69; director of geological survey of Michigan, 1869-71; chancellor of Syracuse Univ., 1872-74; Prof. of Geology and Paleontology in the Univ. of Michigan, 1879 to his death. In American geology what is known as the "Marshall" group was established by him, and fourteen newly discovered species have been named after him. His paleontological researches established seven new genera and 304 new species, most of them fossil.

Win'chester, capital of Hampshire, England; on the Itchin; 60 m. WSW. of London. It is the *Caer-Gwent* of the Britons and the *Venta Belgarum* of the Romans. After being taken in 495 by the Saxons, it received its present name, and was for several centuries the capital of England and the residence of its kings. In the thirteenth century it lost its trade; has since gradually declined. Its cathedral, built in the eleventh century, is a vast but heavy structure, containing many interesting monuments, among them the tomb of William Rufus, the bronze figures of Charles I and James I, the golden shrine of St. Swithin, etc. Winchester College, one of the great public schools of England, was founded here by Wykeham in 1369-93. Pop. (1901) 20,928.

Winchester, capital Frederick Co., Va.; 88 m. W. by N. of Washington, D. C.; 113 m. W. by S. of Baltimore, Md. It is in a wheat-growing region, and contains glove factories, hosiery mills, steam planing mills, flour mill, a sumac and bark mill, tannery, paper mill, shoe factory, and a canning factory. The place is the key to the valley of the Shenandoah, and during the Civil War it was repeatedly occupied by the forces on either side, and in its vicinity were fought several battles (see CEDAR CREEK). The city contains national and Confederate cemeteries. Pop. (1900) 5,161.

Wind, a sensible movement of the air with reference to the earth's surface. In general, a wind is the result of a local disturbance of the density of the atmosphere, in consequence of which the air is set in motion; its motion is then modified by the resistance of the earth's surface and by the daily rotation of the earth about its axis, and may spread into regions far distant from the original seat of disturbance. The most important of the general and periodical currents are the trade winds, which prevail between the parallels of 30° N. and 30° S. latitude, but attain their full breadth and force only in midocean, and are very materially circumscribed near the E. and W. continents. The breadth of the trade-wind zone of the Pacific is not so well determined as in the Atlantic, and the trades of the Indian Ocean show irregularities, depending on the seasons. The whole system of trade winds is divided by a belt of calms about the equator, separating the NE. winds of the N. from the SE. winds of the S. hemisphere. In the equatorial belt of calms heavy rains constantly occur; but in the trade-wind region proper few clouds and light showers are observed. The term antitrades designates the currents that prevail quite uniformly above the trade winds, at a height of 3,000 ft. or more above the earth's surface; this current, known also as the "upper trade" or "return trade," seems to be merely the return to the temperate zones of the air that had flowed at the surface toward the equator.

The term monsoons (Arabic, " seasonal ") is applicable to all winds that with the season change from land to sea winds. Thus on the W. coast of Africa in summer the regular NE. winds are deflected decidedly toward the continent; in Australia and N. America similar phenomena are noted; but the most striking case is that of India, where the NE. trade wind of the N. portion of the Indian Ocean is completely reversed during summer, but in winter is greatly reënforced by the land and sea winds that thus alternate between NE. and SW. Of the hot winds, none is more famous than the simoom of N. Africa and Arabia. The exaggerated accounts of ancient travelers have been modified by observations of recent investigators, from which it appears that this is a strong, hot, dry wind drawn from the heated interior of the continent; it is often accompanied by sand clouds or sand pillars, and its deadly qualities are simply the result of the oppressive heat and the very fine dust. Similar hot winds prevail in Egypt in May and June, and are there known as khamsin. Of the dry winds that flow out from the interior of continents, some are cold, others warm. The northers of Texas are due to a thin surface layer of dry air, which, as it flows from the Rocky Mountains, from Kansas, and from Minnesota S. or SE., loses by radiation the heat it receives from the sun, and, underflowing the warmer, moister air of the Gulf of Mexico, rushes over the smooth surface of the water with thrice the velocity that is observed in the interior of the continent. On the W. coast of Africa the dry E. and NE. winds are known as the harmattan, whose extreme dryness makes them cooling, but they are hotter than the northers and are often loaded with sand. Among storm winds the levante is a strong E. wind on the E. of the Mediterranean; hurricane was at first applied only to the terrible storms of the W. Indies, while typhoon designated the storms of the Pacific; tornado is applied in the U. S. to destructive winds that rush in narrow paths over long belts of territory, with whirling clouds and heavy rain or hail.

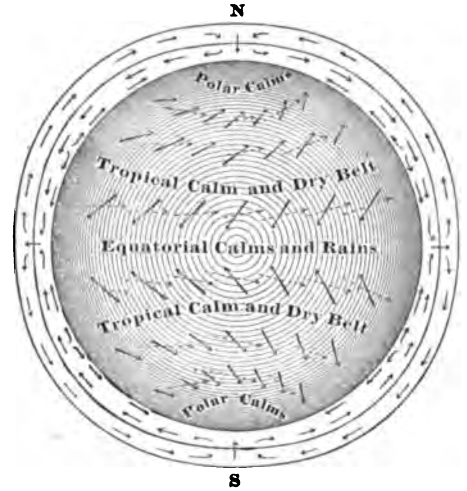

N
Polar Calms
Tropical Calm and Dry Belt
Equatorial Calms and Rains
Tropical Calm and Dry Belt
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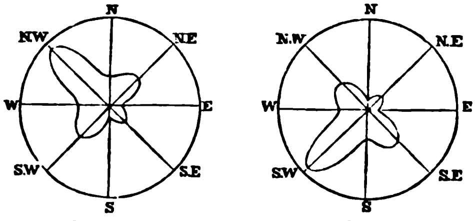
FIG. 1. GENERAL CIRCULATION.



JANUARY. JULY.

FIG. 2.

The speed of wind is measured by the anemometer (*q.v.*). The best-known scale and the one usually employed at sea is the Beaufort, as follows:

WIND FORCE BEAUFORT SCALE.	Common Name.	Velocity, Miles per Hour.
0	Calm	0
1	Light air	3
2	Light breeze	13
3	Gentle breeze	18
4	Moderate breeze	23
5	Fresh breeze	28
6	Strong breeze	34
7	Moderate gale	40
8	Fresh gale	48
9	Strong gale	56
10	Whole gale	65
11	Storm	75
12	Hurricane	90

Win'dermere (called also WINANDERMERE), the largest lake of England; 14 m. long and 1 m. broad. It lies in Lancashire, and is celebrated for the beauty of its shores. Its outlet is the Leven, which flows S. into Morecambe Bay, on the W. coast of England. A group of islands, the largest of which contains 28 acres, is in the center of the lake. The village of Windermere is about a mile from the E. shore of the lake. Pop. 1,500.

Wind'flower. See ANEMONE.

Wind'galls, puffy swellings about the fetlock joints of horses. Tight bandaging, irritant ointments, and rest may apparently cure them, but they are liable to recur. They usually appear on the hind legs in the form of little oval sacs between the back sinews and the bones, just above the fetlocks. At first the puffs, or windgalls, feel soft and elastic, but after some time, if the animal is employed at hard labor, they will become firm and hard. Rubbing is the most effective remedy.

Wind'lass, a form of the wheel and axle, in which the axle is horizontal, while in the capstan it is usually vertical. The axle is made to revolve either by means of handspikes or a winch. The principles involved are those of the wheel and axle.

Wind'mill, device for utilizing the energy of the wind as a motive power; specifically, a wind-driven mechanism for grinding, pumping, etc. The first use of the windmill for doing work is unknown. Prof. John Beckman, of the Univ. of Göttingen, who made a thorough investigation in regard to its history, found a reference to the use of the windmill among the Bohemians as early as 718. Mention was made of the use of windmills in 1105 and again in 1493, but no authentic information in regard to their mode of construction is found until a still later period.

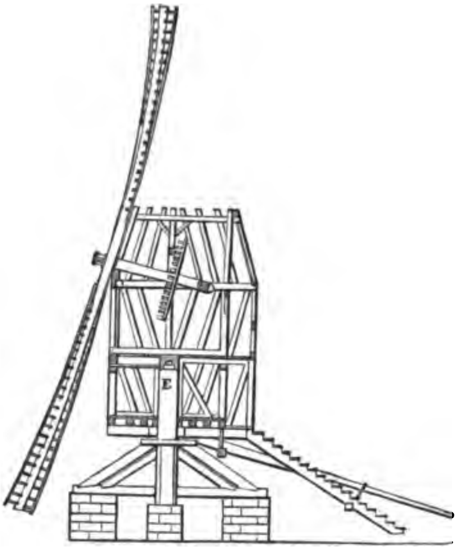


FIG. 1.

A windmill has four essential parts—a windwheel, a shaft or axle to which the wheel is attached, and which is made to rotate by the wheel; wheels and shafts for transmitting the wheel; and other machinery. The manner of making the wheel find the wind has given rise to two classes of these old mills. One, in which the whole frame is turned by hand, as shown in Fig. 1, is called the German mill. The frame rests upon and turns about the post E. In the other only the dome containing the shaft and bevel wheel is rotated, as shown in Fig. 2. In this case the shaft A and bevel wheel attached are stationary, but free to rotate. The movement of the dome in this case is sometimes made automatic by extending an arm to the rear of the wind wheel and mounting thereon a small windmill, S, whose axis is connected by suitable gearing to the dome in such a way as to turn the dome when the small wheel, S, rotates. When the wind wheel is firm to the wind the plane of the small wheel, S, will be in the direction of the wind and it will be at rest; but when the wind veers it will strike the small wheel, setting it in motion, and bring the wind wheel into the proper position by driving the shaft *a*, pinion *b*, beveled wheel *c*, and pinion *d*, which engages a rack, *e*, extending around the tower.

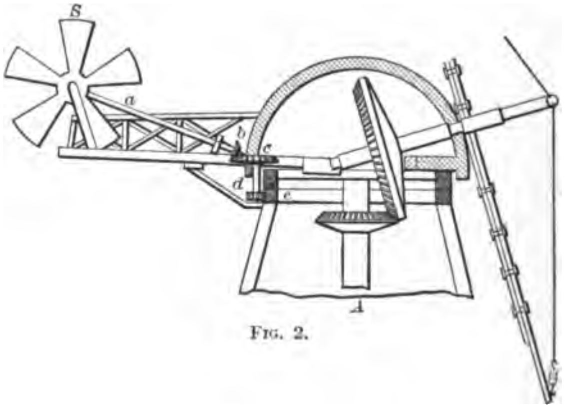


FIG. 2.

Commercially and practically the older types are being displaced by the American mills, whose characteristic features are the large number of narrow radial slats or sails (plane when made of wood, or generally curved when made of iron); the rudder, or tailpiece; the automatic adjustments; and the pyramidal tower, as shown in Fig. 3. The tower was formerly of wood, made on the spot, but more recently it is made of steel, fitted in the shop, and shipped to the place where it is to be erected. Some towers are made of brick or stone. The upper stories may be used for storage tanks and the lower ones for sawmills or other small machinery. They are of all heights, suited to circumstances, usually from 30 to 70 ft.

Windmills are used for a great variety of purposes—on railways for pumping water into storage tanks for supplying locomotives; at residences for family uses; at nurseries for watering plants, etc.; on prairies for irrigation and watering cattle, etc.; for threshing, grinding, feed cutting, and the like; and they might be made to run a sewing machine, to do laundry work, run a dishwasher, blow fans in a dining room, etc. American mills are made of all sizes, from $\frac{1}{16}$ to 4 horse power, and even larger.

Self-regulating devices are made to maintain a more uniform speed. In the "solid wheel" it is turned "out of the wind" by means of a lateral vane placed back of and parallel with the face of the wheel. The wind, by acting against this vane, turns the wheel to one side so that less surface is presented to the wind, and the rudder permits the side vane to operate quickly. This system is represented in the Corcoran wheel (Fig. 4), in which B is the rudder and F the side vane. The wheel may also be turned out of wind by placing the vertical support one side the axis of the wheel; then the pressure of the wind against the wheel will turn the wheel about the vertical axis. The solid wheel may also be adjusted by being so hinged that the wheel may be turned away from the wind while the rudder remains in the plane of the wind. The wheel is held against the rudder by a weighted lever, and when the wind is so strong as to turn the wheel aside it raises the weighted lever at the same time, which, by descent, brings it back into position when the force of the wind slackens. The Buchanan wheel is of this type. Wheels are regulated without a rudder by being so placed as to receive the wind from behind the tower. The tendency in this adjustment is for the wind to keep the wheel fair with the wind; and a vane is placed beyond the wheel perpendicular to its face, which turns the wheel away when desired. This vane is attached to a weighted lever, which it is forced to raise when turning the wheel away, and which brings the wheel back into fairness when the wind slackens. The speed may be adjusted by turning the slate, by means of a centrifugal governor, so that they will present more or less surface to the wind. This is called the "sectional wheel," as opposed to the solid wheel, and was invented by Daniel Halliday.

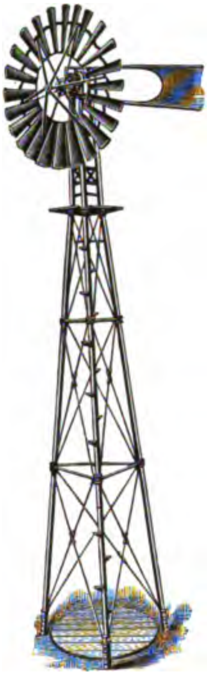


Fig. 3.

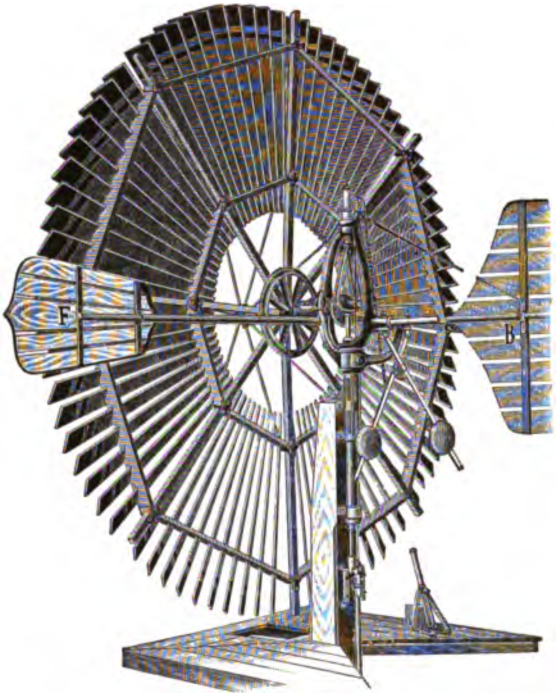


Fig. 4.

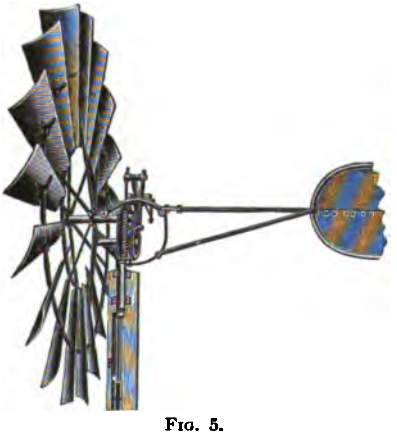


Fig. 5.

The aëromotor shown in Fig. 5 is the invention of Thomas O. Perry, and is of increased efficiency as compared with previous wheels. The wheel is made of steel; the vanes are curved and riveted to the circular sections, properly braced with tie rods; all obstructions to the free flow of wind through the wheel are avoided as far as possible, and all unnecessary adjustment avoided. When not used the rudder may be thrown around parallel with the wheel. It runs with a light breeze, and is durable.

In older types of windmills the upper end of the pump rod was attached directly to a crank driven by the shaft of the wheel, but in many mills of the present day the speed is reduced by gearing. The object is to permit a longer stroke for doing the same work, thereby allowing more time for the valves to get seated; also by reducing the length of the crank, for which provision is made, a short stroke is produced, thus allowing some work to be done with a light breeze. Some pumping mills are provided with an automatic arrangement, operated by a float, for throwing the mill completely out of the wind when the tank is nearly full and bringing it into the wind by a weight when the tank is nearly empty.

Win'dow, an opening in the wall of a building to admit light and air into the interior.

In dwelling houses in ancient times the windows were narrow slits, and it was not until about the end of the twelfth century that glass was used to any great extent in private houses. Windows, properly so called, were almost unknown in the religious edifices of the Egyptians, Greeks, and Romans, the light being admitted at the roof, but they constitute an essential and distinguishing feature of the Gothic style. In modern houses, windows are made capable of being opened and shut by means of casements or sashes. In Britain a window tax was imposed in 1695, and in 1851, when the tax was abolished, each house having more than seven windows was taxed. A dormer window is a window pierced in a roof and so set as to be vertical while the roof slopes away from it.

Wind'pipe. See TRACHEA.

Wind'sor Cas'tle, the principal royal residence of the sovereigns of Great Britain since the accession of George III, and often occupied by the earlier kings. It is built upon a chalk hill near the Thames, 22 m. from London. The older palace of the English kings was at Old Windsor, 2 m. distant, and doubt exists among antiquaries as to the first English king who built solid work of masonry at Windsor Castle. The most ancient portions are the Garter and Cæsar towers, the latter of which forms a bastion of the castle wall. It is one of the most curious antiquities in the whole building. These towers were erected in the reigns of Henry I, II, and III. To the same period belong the S. covered walk of the Dean's Cloister, a door behind the altar in St. George's Chapel, and the remains of Domus Regis in the N. of the chapel. The Norman gateway near the keep, the groining of the Devil's Tower and King John's Tower, and the Dean's Cloister pertain to the time of Edward III. St. George's Chapel was built by Edward IV; the choir roof by Henry VII; the outer gateway of the lower ward by Henry VIII; and the buildings from the Norman gate to the state apartments, including the library, were raised by Elizabeth.

But the castle, as it now appears, is almost entirely the creation of George IV's reign, when about a million sterling was spent upon the place. The courts, the terrace, the gardens, the slopes, and the parks all underwent change and improvement. The internal changes are even more striking than the external. Suites of rooms decorated and furnished with the utmost magnificence, the corridor which runs round two sides of the quadrangle, and the grand staircases immensely surpass what was previously to be seen in the castle. Changes have been made in the pictures, some of the old ones having been sent away and others introduced; a museum of curiosities has been arranged in a small gallery on the N. side; the library has been improved; the plate closet, containing silver and silver-gilt services; the engravings, the miniatures, and the drawings are of great value; and the collection of porcelain is thought to be unequaled in Europe; but no facilities are afforded for the study of the works of art in the castle, even when they are national property. The Wolsey Chapel contains the tombs of Prince Leopold, Duke of Albany, and the Duke of Clarence. It has been magnificently decorated, and contains a cenotaph to the Prince Consort.

Wind'ward Is'lands, originally the CARIBBEE ISLANDS, or LESSER ANTILLES, that portion of the W. Indian archipelago which forms a N. and S. chain on the E. side of the Caribbean Sea, from the Virgin Islands to Trinidad. The name was given in allusion to the prevailing winds, which in this region blow almost constantly from the E. (See WEST INDIES.) Officially, the name is now restricted to a British colony, embracing the islands of Grenada, the Grenadines, St. Vincent, and St. Lucia. The capital is St. George's, in Grenada.

Wine, properly, the liquor obtained by fermentation of the juice of grapes, but, in less strict usage, also certain beverages prepared from the juices of other fruits. The composition of grape juice varies not only with the variety of the vine, but also with the climate, the soil, the nature of the manures employed, the aspect and exposure of the vineyard, the seasons, and the stage of ripeness at which the gathering takes place. Among peculiar constituents present in the skins are tannic acid and coloring matters; in the seeds, a fatty oil. The entire solid matters of the juice, the larger portion being sugar, may mount up in ripe grapes to forty per cent, but commonly the proportion is much less. The sugar ranges from thirteen to thirty per cent of the weight of the juice. The *fermentation* by which must (the expressed juice) becomes wine starts spontaneously, under the influence of minute germs adherent to the outside of the berries or afloat in the air, within a time varying, according to temperature, from a few hours to several days after pressing. The must becomes increasingly turbid, gas bubbles begin to rise, and soon bring with them particles of yeast (see FERMENTATION), which tend to accumulate on the surface.

Upon the subsidence of the violent fermentation the yeast, with more or less of tartar, gummy and albuminoid matters (*lees*) and grape débris, and pomace, settles to the bottom, while the liquid clears and is then carefully drawn off into casks to undergo the after-fermentation, during which the remaining sugar (one half to two per cent) ferments out slowly, and the formation of the bouquet begins. Great care must now be taken to prevent access of air and consequent acetification, yet without incurring the risk of bursting the casks by tight bunging. Hence, as the wine diminishes by evaporation through the wood, the empty space must be filled up with other wine (*ullage*), a practice which must thereafter be continued so long as the wine remains in wood. The after-fermentation may last from six weeks to several months; during that time an abundant deposition of lees takes place; these consist largely of tartar with some yeast, and gummy and albuminous matters, and are utilized in the making of cream of tartar.

When fermentation has completely ceased the young wine is again drawn (*racked*) off, preferably into smaller casks, in which the maturing or aging is to take place. This process depends essentially on the gradual action of atmospheric oxygen, which enters through the pores of the wood, for in air-tight vessels no bouquet is formed. The maturing process is hastened by frequent racking (every two months), during which the wine is for a short time exposed to the air and absorbs oxygen.

In those varieties of the grape in which (and this is the case particularly with those grown in the warmer climates) the sugar is present in very large proportions, the supply of ferment is exhausted before the sugar is all changed; and the portion of sugar thus left in the wine renders it sweet, as in the wines commonly known as sweet or "fruity," or as natural *vins de liqueur*. Of such wines, Tokay and Malmsey are examples. The excess of sugar in a wine also acts commonly to preserve it against the vinegary fermentation; so that muscadine wine has been kept for two hundred years, and Tokay at the age of a century is in its perfection. But in grapes in which, as is common in the cooler vine-growing latitudes, the proportion of sugar is small, this may be wholly decomposed and replaced by alcohol by the time the ferment is exhausted, or even before. The resulting wines are characterized by the alcohol, acids, and absence of sweetness, and are called "dry," or "sec." Sherry is one of the best examples of this sort.

In cases in which the sugar is exhausted before the ferment, the practice of adding to the fermenting must another portion which has been greatly concentrated by boiling is often resorted to for the purpose of supplying the deficiency; and a wine otherwise dry and acid may thus be converted into one that is sweet. Wines bottled while the process of fermentation is going on will also contain carbonic acid gas, and will in consequence, if drunk immediately on uncorking, have the quality of "briskness"; where the quantity of the gas is considerable, such wines sparkle when agitated in the light. They are distinguished as "sparkling" (such as champagne), while those which do not sparkle are "still." The fragrance and an important part of the flavor of wines are due to the presence of some peculiar volatile matter, the effect of which is technically distinguished from the simple flavor, and which is known as the perfume or *bouquet*.

The following table gives the volume percentage of alcohol contained in some of the best-known wines, varying greatly, of course, from year to year:

Rhenish and Moselle wines	9.1 to 12.0
Grüneberger, Naumburger (NE. Germany)	6.5
Burgundy, red	7.5 to 13.5
Bordeaux, first class	7.0 to 11.5
Catawba, Concord, etc	8.5 to 12.7
California wines	10.5 to 15.0
Port	18.0 to 23.0
Sherry	17.0 to 21.0
Madeira	17.0 to 19.0
Tokay	12.0 to 20.0
Greek and Syrian wines	14.0 to 18.0

France stands at the head of wine-producing countries, and produces a variety of red wines, of which those most esteemed are grown in the Bordelais and in Burgundy, as well as in Dauphiné. The Bordeaux wines (clarets) have a full, agreeable bouquet, a good deal of body, are spirited yet not heady, with a decided astringency and acid, and permit of much dilution with water, with but little loss of zest; they form the bulk of French export wines; first class are Château Lafitte, Château Latour, Château Margaux, Haut Brion, etc. Second-class clarets are, *e.g.*, those of St.-Julien, St.-Estèphe, Cantenac of the Bordelais, those of the Champagne, the Lyonnais, and Dauphiné. The Burgundy wines, such as Chambertin, Clos Vougeot, etc., are rather heavy, oily, less astringent and acid, with a fine, peculiar aroma, and will not bear long shipment. *Petits vins*, or *vin ordinaire*, is produced in all but eight out of eighty-six departments. The white wines of France are stronger and have more body than the Rhenish wines: first-class are the "Haut Sauterne" of Château Yquem, of the Bordelais; also some white wines of Burgundy and Champagne.

Foremost among the wines of Germany are the high-flavored, dry Rhenish wines, grown from Alsace down to Coblenz, in the valley of the Rhine and its tributaries. The Moselle wines resemble those of the Rhine in flavor, but are light and acid; the wines of Franconia are also acid, but heavier, and not so high-flavored. Those of NE. Germany (Silesia, Saxony) are very acid. Italy produces abundance of wines, which in the N. (Piedmont, Tuscany) are chiefly "dry" reds, such as those of Asti, Monte Pulciano, and Fiascone, the Chianti, etc.; while southward, and especially in Sicily, Lachryma Christi and Marsala are best known.

Of American wines, those of California approach most nearly to those of Europe, being made from the same varieties of grapes, which are unadapted to the climatic conditions E. of the Rocky Mountains. The variety of climates within California seems to render feasible the production of all the various types of wines of middle and S. Europe. The best wines of California growth are unfortunately now commonly sold to consumers under various French labels, leaving mainly the inferior qualities credited to the state. The high qualities of the best Californian wines, however, have been repeatedly recognized by French experts. The wine product of California has for years ranged from 15,000,000 to 20,000,000 gal.

Winkelried (vĭnk'ĕl-rēt), **Arnold von**, d. abt. 1386(?); Swiss patriot; a native of the canton of Unterwalden. According to the legend, he decided by his patriotic self-sacrifice the battle of Sempach, July 9, 1386, in which a small Swiss force was engaged with a large Austrian army under Archduke Leopold. By gathering the lances of Austrian halberdiers into his body and bearing them down to the ground he effected a breach in the Austrian line through which the Swiss made the attack. The question of the truth of the legend has furnished the subject of an extensive literature.

Winneba'go Lake, the largest body of water entirely within the limits of Wisconsin; traversed by the navigable Fox River. It is 26 m. long, and has a maximum breadth of 10 m. Area, 212 sq. m. It is 748 ft. above the sea.

It is navigated by steamboats, and abounds in fish of various species. A part of its E. shore has been curiously walled with stones that have been forced shoreward by the expansion of the ice in winter. On its banks are Oshkosh and Fond du Lac.

Win'nipeg, capital of the province of Manitoba, Dominion of Canada; the largest city of the Dominion W. of Lake Superior, and the third in size in British N. America; at the junction of the Red and Assiniboine rivers. Winnipeg covers an area of about 12,750 acres. Main Street, running N. and S. from the Assiniboine to the N. limit of the city and parallel with Red River, and Portage Avenue, running E. and W., are the principal business streets, though most of the wholesale houses are on Princess Street and its vicinity. The city hall and the post office, together with the legislative buildings, lieutenant governor's residence, courthouse, the university building, and armory are the principal public buildings. There is an Anglican cathedral and archbishop's residence, and a constantly increasing number of Church of England, Presbyterian, Methodist, Baptist, Congregational, Lutheran, and Roman Catholic churches. The Roman Catholic cathedral is in St. Boniface, a suburb on the E. side of Red River. St. John's College, for Anglicans, the Methodist College, the Presbyterian College, and the Roman Catholic College at St. Boniface comprise the Manitoba Univ., and there are twelve large public schools. The Winnipeg general hospital, the St. Boniface hospital, and the Deaf and Dumb Institute receive government aid.

Winnipeg is governed by a mayor and board of control elected by general vote, and a council of twelve elected by six wards, there being a separate organization of trustees for the government of the public schools. The city is to a large extent the distributing point for the whole of the territory between Lake Superior and the Rocky Mountains. Large flour mills, linseed oil mill, lumber mills, foundries, and the Canadian Pacific and Canadian Northern Railway's shops, barbed wire factories, an abattoir, and a pork-packing establishment are on the St. Boniface side of the Red River. All the leading banks of Canada have branches in Winnipeg, many having fine buildings, the city usually ranking third in the monthly return of banking business of the Dominion.

Winnipeg was incorporated in 1873. At the junction of the Red and Assiniboine rivers the Hudson Bay Company's post, Fort Garry, had drawn round it a small settlement. In 1870, when the Red River expedition under Col. (later Lord) Wolseley arrived at Fort Garry to dispossess the insurgent Riel, there was a population of about 200 people within a mile of the fort. This served as the nucleus of the city of Winnipeg. (See MANITOBA.) The rush of people from other parts of Canada, consequent upon the opening up of the country and the location of the capital of the new province at Fort Garry, determined the question of the future central point, and the population rapidly increased. When rail communication through N. Minnesota was completed, the growth of the city continued more steadily, and was again largely augmented by the construction of the Canadian Pacific Railway. The reaction from the boom of 1881-82 was felt for a few years, but the settlement of the farming lands, the produce of which passed through Winnipeg, enabled the city to recover its steady growth. Eight lines and branch lines of railway converge in Winnipeg. Pop. (1910) 172,000.

Winnipeg Lake, a large sheet of water in Manitoba, Canada. It is about 4 m. wide at its S. end, narrows in the center, and then extends for 275 m., expanding to 60 m. at its N. extremity. It is the reservoir of a number of rivers, chief among which is the Winnipeg, draining the Lake of the Woods and country W. of the height of land that separates the waters flowing into Lake Superior from those of the W.; the Great Saskatchewan, which with the Assiniboine, whose waters also fall into it, drains the provinces of Alberta and Saskatchewan; and the Red River, flowing between Minnesota and N. Dakota, and flowing through Manitoba. Lake Winnipeg discharges through the Nelson River into Hudson Bay. It is about 9,000 sq. m. in area and 710 ft. above the sea—112 ft. higher than Lake Superior. It is rocky and rugged on its E. coast, but flat and marshy on the W. At the head of the lake is Norway House, formerly one of the chief distributing ports of the Hudson Bay Company. There is a large Icelandic settlement on the W. shore, back of which the country is fertile and wooded. The lake produces much whitefish. There is a small trade between the lake and Selkirk in Manitoba, which will be considerably increased when the rapids of St. Andrews, on the Red River, halfway between the lake and the city of Winnipeg, have been locked.

Wino'na (settled in 1851), capital of Winona Co., Minn.; on the Mississippi River; 27 m. NW. of La Crosse, Wis., 104 m. SE. of St. Paul. It is surrounded by towering bluffs, including Sugar Loaf and Trempealeau mountains, and is famed for its picturesque scenery. The noteworthy buildings include the U. S. Govt. building, the state normal school, high school building, Winona Seminary. The city is an important market for grain and other products of this part of Minnesota and the neighboring part of Wisconsin, and has flour and lumber mills, wagon factories, and farm-implement works. Pop. (1906) est. at 20,458.

Wins'low, Edward, 1595-1655; Governor of Plymouth colony; b. Droitwich, England; embarked on the *Mayflower*, and was one of the party to explore the coast of Cape Cod and discover Plymouth harbor; married Mrs. Susannah White, theirs being the first marriage in New England. He offered himself as a hostage to Massasoit, and obtained the friendship of that chief by curing him of a severe illness; was chosen governor, 1633, 1636, 1644. He revisited England several times, and was once imprisoned for seventeen weeks by Archbishop Laud for having in Plymouth, being a layman, taught in a church and performed the ceremony of marriage. He died at sea while on a mission for Cromwell against the Spanish settlements. His portrait at Plymouth is said to be the only authentic likeness of any of the *Mayflower* pilgrims.

Winslow, John Ancrum, 1811-73; American naval officer; b. Wilmington, N. C.; entered the U. S. navy as a midshipman, 1827; lieutenant, 1839; served with distinction in the Mexican War. In 1863-64 he was given command of the steamer *Kearsarge*, on the special duty of pursuing the Confederate privateer *Alabama*. In June, 1864, he found the *Alabama* off Cherbourg, France, and blockaded her in that harbor. On the nineteenth, after notifying Capt. Winslow that he would fight, Capt. Semmes steamed the *Alabama* out of the harbor, and when 7 m. from shore Capt. Winslow headed the *Kearsarge* toward the privateer. The latter discharged the first shot, but after an engagement of an hour and a half she sank. Some of her officers were picked up by the English yacht *Deerhound*, at Winslow's request, which then steamed away to England with them. Capt. Winslow received the thanks of Congress, and was promoted commodore for his victory. In 1866-67 he commanded the Gulf squadron; in 1870-72, was commander in chief of the Pacific squadron; and, 1870, was promoted rear admiral.

Win'ter, astronomically, that season of the year which begins with the shortest day, December 21st, and ends with the vernal equinox, March 21st. In ordinary speech, however, winter comprises the three coldest months, namely, December, January, and February in the U. S., and November, December, and January in Great Britain. In the S. hemisphere the winter months are June, July, and August, and in the tropical zone the rainy season corresponds to the winter.

Win'ter Ber'ry, any one of several American shrubs, forming a subgenus of holly; more particularly the black alder, which ranges from 5 to 12 ft. in height, grows on the edges of swamps, bears clusters of small white flowers, and in November and December an abundance of brilliant crimson berries, sometimes employed in domestic medicine as a bitter tonic.

Win'tergreen, one of the popular names (checkerberry, boxberry, partridge berry, mountain tea, etc.) for an evergreen undershrub of the heath family found everywhere in the damp places of the woods of the N. temperate zone, especially under the shade of evergreens in the forests of Canada and the N. U. S. The stem is from 5 to 6 in. high, with a few leaves, and small flowers appearing in May and June. The berries, which are red, ripen in autumn and remain the winter over. They form a large part of the food of the partridge. Both berries and leaves have the aromatic flavor of sweet birch. See GAULTHERIA.

Wintergreen, Oil of, or **Oil of Gaulthe'ria,** an aromatic liquid contained in the leaves of the wintergreen, also in sweet birch, and probably in the roots of other plants. It is colorless when freshly prepared, but gradually acquires a yellowish or reddish hue; possesses a peculiar sweetish taste and an agreeable odor. Wintergreen oil contains about ninety per cent of methyl salicylate (gaultheric acid), and ten per cent of a compound termed *gaultherilene*, similar to oil of turpentine. It is used in the treatment of rheumatism and gout; also to disguise the taste of disagreeable medicines and in confectionery.

WINTERGREEN, WITH SECTION OF FRUIT.

Win'throp, John, 1588-1649; first colonial Governor of Massachusetts; b. Groton, England; studied at Trinity College, Cambridge, 1602-5; is said to have been a justice of the peace at the age of eighteen. He was chosen Governor of the "Company of the Massachusetts Bay in New England," 1629; was the leader of the great emigration of 1630, when he sailed in the *Arbella* at the head of a small fleet bearing some 900 colonists; wrote on board the *Arbella* his treatise, "A Modell of Christian Charity"; landed at Salem, June 22, 1630. Endicott had been appointed by the Massachusetts Bay Company to govern the colony in subordination to the governor and company in London, but a change of great historical importance was now made. The entire government was transferred to America, with Winthrop as governor. He was annually reelected until 1634, and by his defeat in the ensuing election escaped the chief responsibility for the proceedings against Roger Williams. He was again defeated in 1636 by young Sir Henry Vane, then recently arrived; but he defeated Vane in the next election (1637), and held office till 1640. As a leading opponent of the Antinomians he took an active part in the banishment of Mrs. Hutchinson and her followers, and in the controversy with Vane. He was again governor, 1642-44; deputy governor, 1644-45; and governor, 1646-49. He left an interesting and valuable body of correspondence, and his "Journal" is an important source of American history.

Winthrop, Theodore, 1828-61; American soldier and author; b. New Haven, Conn.; graduated with honors at Yale College, 1848; traveled in Europe, 1849–51; resided two years at Panama; was admitted to the New York bar, 1855; joined the Seventh Regiment of New York on its entering the national service, April, 1861; was commissioned major in the New York Volunteers; became a member of the staff of Gen. B. F. Butler as his military secretary, and was killed in the war, at Big Bethel, Va. In the *Atlantic Monthly* from June to September of that year were published several spirited sketches of early war scenes which attracted great attention, and he left ready for the press the materials of five volumes of novels and essays, several editions of which were immediately sold.

Wire and Wire'drawing. The making of wire depends upon the ductility of metals—that is to say, upon their property of being drawn out into attenuated form. This property is quite different from a capacity for working under the hammer—copper, which is third among the metals in the order of its malleability, being sixth in ductility. Gold, however, stands first in both properties, and silver stands second in both. Apparently these were the first metals from which wire was made. The first wire was made by beating the metal into thin sheets, then cutting these into narrow strips, which were rounded by hammering or filing. Such wire was woven with textile material into fabrics—literally, the cloth of gold. The date when silver was first made into wire is uncertain, the earliest that can be fixed being the time of the later Byzantine emperors. The period when the draw plate with graduated holes or dies was introduced is not known. As ornament was the most important use for wire drawn of the precious metals, the discovery that by flattening it a given weight could be wound around three times the length of textile fiber was an important step forward, this being the method in which gold and silver is often applied for tassels, fringe, etc., to this day.

In modern times what is known as gold wire has an exterior of gold and a core of silver, being made by forming a cylindric ingot of silver and coating the latter with gold. This compound ingot is gradually reduced in size by means of the draw plate—that is to say, by passing it through a succession of holes or dies in a hardened steel plate—first, through one only slightly smaller than the original diameter of the ingot, then through another still smaller, and so on until the requisite reduced diameter is reached. The finest wire ever made (that substituted for the spider-web lines of telescope micrometers) is made by first covering a platinum wire with solid silver. This compound wire, platinum within and silver without, is then reduced in diameter in the same manner as the gold wire with the silver core. This compound wire may be thus brought down to a diameter of $\frac{1}{300}$ of an inch. Assuming a platinum core to be one tenth the whole diameter, this core will be $\frac{1}{3000}$ of an inch. This fine compound wire being then dipped into hot nitric acid, the silver is dissolved and the inner core of platinum remains. Platinum wire was made by this means by the inventor, Wollaston, as fine as the $\frac{1}{18000}$ of an inch in diameter.

Wire is for the most part made of iron and steel. Brass and copper wire are also largely made, the methods being about the same as with iron. In making iron wire, rods of the metal have their surfaces cleaned of scale or oxide, and are then passed through the successively diminishing holes of the draw plate —for example, ten, fifteen, thirty, or more times, according to the degree of fineness required. The constant compression of the metal hardens the wire, so that it has to be repeatedly annealed. This is done by placing the wire in kilns, which are first heated to redness and then allowed to cool gradually. Twenty-four hours is the time ordinarily required for annealing the smaller grades of wire. Six or eight annealings are necessary; very small wire requires more. A scale is formed upon the wire at each annealing, and this is removed by pickling in dilute sulphuric acid. Wire is sold in coils, and those of the more rigid and stiffer kinds are straightened for use by being passed alternately back and forth on two rows of alternating pins placed a slight distance apart. The wire is thus made to pass in a zigzag course through the device, which is termed a riddle, and comes out straight. Cast-steel wire is made from steel rods hammered to about one quarter of an inch square by a tilt hammer, and afterwards made round on the anvil. A spurious gold wire, called "gold wire of Lyons," is made by beating copper to a red heat and exposing it to the fumes of zinc, which turns the outside of the metal into brass. Brass wire loses its strength when exposed to the fumes of acid, and even by long exposure to a damp atmosphere. Zinc wire is flexible, and at first as strong as copper, but resumes the original crystalline state of the metal when subjected to the action of boiling water. One of the most unique uses of wire is the production of surfaces for printing calico, in which copper wires are imbedded in the block, then filed down to a flat surface, and thus form the slightly raised figures upon which the pattern is printed. Much wire is used for making nails.

A great extension of the wire manufacture has occurred from the use of barbed wire for fences. Other fencing wires are made devoid of barbs, one of the best being oval in cross section and wavy longitudinally, the alternating curves being in the plane of the greatest diameter of the wire. To prevent rusting, fence and telegraph wires are galvanized. (See Galvanized Iron.) One of the most valuable improvements in wire manufacture was that patented in 1858 by Henry Waterman, which reduced the cost of tempering flat steel crinoline wire from $3 a pound to three cents. Previous to this the tempering of such wire was done by winding it in volute coils kept apart by interlaced iron wires, the coils being heated to the requisite degree in a furnace, and then plunged in a hardening bath. In the improved process the wire was drawn through the fire of a furnace, and guided directly from the fire into the hardening bath.

Wire'less Tel'egraph. See TELEGRAPHY, WIRELESS.

Wireless Tel'ephone. See TELEPHONE, WIRELESS.

Wire Rope. See ROPES AND ROPE-MAKING.

Wire'worm, a term applied to the larvæ of various beetles, but properly restricted to the larvæ of spring beetles, click beetles, skipjacks, snapping bugs, etc. The family comprises a number of genera and many species, averaging about one third of an inch in length. The prevailing color is brown, but a few are jet black and others speckled with white. The larvæ of many species which feed upon the roots of living plants are known as wireworms. The worms are from one to three (or in cold climates even five) years attaining full growth, and undergo a large number of molts. The head is somewhat flattened, and there are six true legs near it; the body consists of thirteen joints. When full grown they descend deeper into the earth, and go through their transformations within an oval cavity, issuing as beetles in early summer. Wireworms damage all grasses and cereals, often ruining root plants and bulbous flowers. Crops grown on land recently broken suffer most from them. In the U. S. the crops most affected are wheat and Indian corn. One of the most effectual ways to prevent their injuries is to fallow the land for one year, and in a small plot they may be trapped by strewing sliced vegetables on the surface. Fall plowing, by which the worms are exposed to their natural enemies, and submersion are practicable ways of destroying them. Rape cake mixed with Paris green and spread over a field is the best remedy.

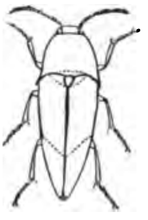


FIG. 1. CLICK BEETLE.

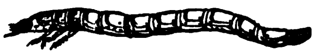


FIG. 2. WIREWORM.

Wirt, William, 1772-1834; American lawyer; b. Bladensburg, Md. In 1799 he settled in Richmond, and in 1803 published in the *Virginia Argus* his "Letters of a British Spy," principally sketches of prominent public orators. In 1816 he was appointed U. S. attorney for Virginia, and from 1817 to 1829 he was Attorney-general of the U. S., afterwards residing in Baltimore. In 1832 he was the candidate of the Antimasonic Party for the Presidency, and received the electoral vote of Vermont. His best-known work is a biography of Patrick Henry.

Wiscon'sin, one of the U. S. of N. America; the seventeenth state admitted to the Union; popularly called the BADGER STATE; capital, Madison.

It is bounded N. by Lake Superior, NE. by the upper peninsula of Michigan, E. by Lake Michigan, S. by Illinois, and W. by Iowa and Minnesota; extreme length, N. to S., 300 m.; extreme breadth, 250 m.; area, 56,040 sq. m., of which 1,590 sq. m. are water surface; pop. (1910) est. at 2,400,578.

There are no mountains in Wisconsin; the lowest level is 600 ft. above the sea and the highest 1,800 ft. The greatest swell is the Penokee range of Laurentian or granite hills, running NE. by SW., some 30 m. S. of Lake Superior. A ridge of Niagara limestone follows the shore of Lake Michigan, about 30 m. in the interior, and in the main separates the lake drainage from that of the Mississippi. In the Glacial period Wisconsin, excepting about 10,000 sq. m. in the SW., was covered by the ice cap, which left about 2,000 minor lakes in the E. and N. portions, with many picturesque gravel knolls, domes of drift, peaks, and ridges. One of the chief characteristics of the state is the diagonal valley occupied by Wisconsin and Fox rivers and Green Bay. About the center of this valley, at Portage, the Fox and Wisconsin rivers (the one a member of the Great Lakes drainage system, the other flowing into the Mississippi) are separated by a marsh but 1½ m. in width, which is sometimes overflowed in spring. The principal Wisconsin rivers which flow into Lake Superior are the St. Louis, Bois Brulé (a famous trout-fishing stream), Bad, and Montreal; into Green Bay are discharged the Fox, Pensaukee, Oconto, Peshtigo, and Menominee; Lake Michigan receives the Kewaunee, E. and W. Twin rivers, Manitowoc, Sheboygan, and Milwaukee; and the chief rivers emptying into the Mississippi from Wisconsin are the Wisconsin, Black, Trempealeau, Buffalo, Chippewa, and St. Croix, the latter forming with the interlocking Bois Brulé a famous French fur-trade route. The largest interior lake is Winnebago.

In the central part of the state are wide areas of comparatively unfertile, sandy soil, derived from the underlying sandstone; in the Penokee range are tracts too rocky for agriculture; but for the most part the soils are arable, and some of them highly fertile, consisting in the drift area of sandy and clay loams, derived from the mixture of preglacial soils and glacial grindings, and in the driftless SW., of the results of the decomposition of underlying limestone. Before the advent of whites, heavy forests covered much of the state—oaks, maples, ash, poplars, hickories, and the like. Great regions in the N. were timbered with pines, hemlocks, and spruce. In the S. and W. the colonists found large prairies surrounded by forests of hard wood, and also much country in which the woods were dotted with small treeless areas. Most of the timber in the S. and E. has been removed by settlers, and the N. pines have suffered much depletion from lumbering; but there remains a large belt of "pinery district." The chief farm products are Indian corn, oats, potatoes, barley, root crops, grass seed, and wheat; in the S. counties of Dane, Rock, and Jefferson tobacco is an important crop; live stock and dairy products are large interests in the S. and E.; and there are large cranberry marshes. The severe winters are not favorable to the culture of apples, grapes, peaches, and pears, but many small fruits and vegetables are grown. The capital invested in nurseries is about $500,000.

The climate is similar to that of other interior states upon the same latitude. The winters are protracted and often severe, the mean winter temperature varying from about 25° in the S. counties to about 15° on the Lake Superior shore; but the atmosphere is dry, and this low temperature does not represent the discomfort it would induce in seaboard states. The summer is brief and warm, the mean temperature varying from about 70° in the S. to about 60° in the N., but there are frequent brief rains and cool S. and E. winds.

Wisconsin is divided into seventy-one counties. Important cities and towns are Racine, La Crosse, Oshkosh, Sheboygan, Madison, Green Bay, Eau Claire, Marinette, Fond du Lac, Appleton, Janesville, Ashland, Wausau, Manitowac, Kenosha, Beloit, Stevens Point, Merrill, Watertown, Chippewa Falls, Waukesha, Neenah, Baraboo, Menomonee, Oconto, Menasha, Portage, Marshfield, Antigo, Beaver Dam, and Kankanna. The principal industries in the order of the value of output are lumber and timber, flouring and grist mills, foundry and machine-shop products, cheese, butter, and condensed milk, leather, malt liquors, slaughtering and meat packing, paper and wood pulp, iron and steel, furniture, lumber, planing-mill products, sash, doors, and blinds, agricultural implements. The fishing industry is of importance, and the fishing interests of the state are controlled by a state commission which conducts large hatcheries at Madison, Bayfield, and Milwaukee for the artificial propagation of fry, with which the Great Lakes and inland waters are annually stocked.

In 1908 there were 465,306 pupils enrolled and 14,659 teachers; normal schools, state schools for deaf, deaf-mute, blind, indigent, and incorrigible children; and a state university. The state university has also in charge a far-reaching system of farmers' institutes, and was a pioneer in university extension. An important work in connection with public instruction is the fostering of town and district libraries. The Roman Catholic Church, in addition to parochial and charitable schools, maintains several colleges, chiefly Pio Nono, at St. Francis; Marquette (Jesuit), at Milwaukee; Sta. Clara, at Sinsinawa Mound; Ste. Catherine, at Racine, and St. Lawrence, at Mt. Calvary. The Lutheran colleges are Concordia, at Milwaukee; Northwestern Univ., at Watertown; a theological seminary at Wauwautosa, and a mission house at Franklin. Other denominational colleges are chiefly Beloit and Ripon (Congregational), Lawrence Univ. (Methodist), at Appleton; Milwaukee-Downer (Congregational), at Milwaukee; Racine (Protestant Episcopal), Milton (Seventh-day Baptist), Carroll (Presbyterian), at Waukesha. The state board of control has supervision over the insane hospitals near Madison and Oshkosh, school for the deaf, at Delavan; school for the blind, at Janesville; industrial school for boys, at Waukesha; state prison, at Waupun; home for the feeble-minded, at Chippewa Falls; the state school for dependent children, at Sparta; and the reformatory, at Green Bay. The board also supervises four semistate institutions—the Milwaukee Insane Hospital, Milwaukee House of Correction, Wisconsin Industrial School for Girls, at Milwaukee; and the Wisconsin Veterans' Home, at Waupaca.

The legislature is composed of a senate of 33 members and an assembly of 100. Only males, twenty-one years of age, are qualified to vote. If a foreigner, the voter must have resided one year within the state and declared his intention to become a citizen. Indians made citizens by Congress may vote. There is a state Supreme Court, with five justices, seventeen circuit judges, a probate judge in each county, and in certain cities municipal judges, all elected by popular vote.

The first white settlement in Wisconsin was made at Green Bay in 1639 by the French. It was under the laws of Canada; but in 1796 the U. S. annexed it for purposes of government to the NW. Territory, ceded by Virginia and other states to the U. S. In 1809 it was included in the Territory of Illinois, as then formed; in 1818, when Illinois was admitted into the Union as a state, Wisconsin was annexed to Michigan Territory. The Indians became troublesome, and the Black Hawk War ensued in 1832. They removed to reservations beyond the Mississippi. July 3, 1836, a territorial government was organized, which at first included a part of the upper peninsula of Michigan, the whole of Minnesota and Iowa, and that part of Dakota lying E. of the Missouri and White Earth rivers. On the admission of Michigan into the Union as a state, a part of the Lake Superior region was set off to her, and when the Territory of Iowa was formed it included all the region W. of the Mississippi. The first effort to procure the admission of Wisconsin to the Union as a state was made in 1846. A convention was held in that year and a constitution drafted. Congress passed an act admitting the state under this constitution in 1847, but the people rejected the constitution on account of some objectionable features. Another convention was called, December 15, 1847, which submitted a new constitution; this was ratified in March, 1848, and the state was admitted to the Union by act of Congress May 29, 1848. In the war of 1861-65 Wisconsin took front rank on behalf of the Union, sending to the armies one half of her voters. Her death roll was 12,301, or 16.6 per cent of her total enlistment. The famous Iron Brigade was chiefly composed of Wisconsin men.

Wisconsin Riv'er, a river that rises in Vieux Desert Lake (partly in Michigan and partly in Wisconsin), flows in a generally S. course to Portage City, Wis., where it turns to the SW. It reaches Mississippi River 4 m. below Prairie du Chien. Breadth at its mouth, 1,800 ft.; elevation, 600 ft. Its length is over 600 m. It is navigable 200 m. to Portage City, whence a short canal leads to Fox River. The channel of the Wisconsin is much injured by shifting sand bars. The upper part of the river passes through heavy pine forests. Several cataracts, of which the most famous are those of the Dalles of the Wisconsin and Grandfather Bull Falls, break the course of this picturesque stream.

Wisconsin, Univer'sity of, an institution of higher learning at Madison, Wis.; incorporated in 1838 and organized in 1848. In 1849 a preparatory department was established; in 1850 the university was formally opened; in 1851 the first college classes were formed. Congress in 1838 granted 46,080 acres of land for the support of a university, and in 1854 it made another grant of the same amount. In 1866 the university also received 240,000 acres of land from Congress. In 1889 this was supplemented by a grant which will ultimately amount to $25,000 a year. The university also has received liberal money appropriations from the state. The university domain consists of about 350 acres, extending a mile along the S. shore of Lake Mendota. Students in 1909 numbered 4,500. The university comprises a college of letters and science, a college of mechanics and engineering, a college of agriculture, a college of law, a school of economics, political science, and history, and a school of music. All the departments are open to women.

Wis'dom, Book of, one of the Apocrypha of the Old Testament; written in Greek, apparently during the latter half of the second century B.C. It is a "wisdom" book, like the books of Job, Proverbs, and Ecclesiastes, the New Testament book of James, and several of the Apocrypha. For greater effectiveness, the author speaks in the name of Solomon. In the earlier copies of the Septuagint it is called the Wisdom of Solomon; but from the time when Jerome demonstrated that Solomon was not its author, his name has been generally omitted from the title. By Roman Catholics the book is regarded as canonical, on the same basis with others of its class. The Greek is more nearly classical than in most of the Apocrypha, and the contents, on the whole, of a high order.

Wista'ria, a genus of climbing shrubs of the pea family. *Wistaria consequana,* a native of China, is one of the most beautiful spring flowering climbers. *W. frutescens* is a smaller ornamental species, growing wild in the W. and S. parts of the U. S. in rich wet soils.

Witch and Witch'craft, a person supposed to have formed a compact with Satan, and the practice of the powers thereby acquired. The subject of witchcraft has been treated generally in the articles DEMONOLOGY and MAGIC, and in this article a more particular account of the Salem witchcraft will be given. At the time of the settlement of the country the belief in witches was general, and unknown diseases, extraordinary occurrences, or circumstances not explainable upon known theories, were commonly attributed to the influence of the devil and the agency of witches. Witchcraft was regarded as the blackest of crimes, and the punishment of death was inflicted on persons convicted of it. During the winter of 1691–92 a company, consisting mostly of young girls, was in the habit of meeting at the house of the clergyman, Mr. Parris, in Salem Village (now Danvers Center), for the purpose of practicing the arts of necromancy, magic, etc. They soon began to exhibit strange actions, exclamations, and contortions, at times being seized with spasms, dropping insensible to the floor, or writhing in agony. The village physician declared the children bewitched, an opinion in which a council of the neighboring clergymen, including Mr. Parris, concurred. They were brought before the magistrates for an examination on March 1, 1692. The excitement became extreme, and spread through the neighboring country; others were accused, and the most eminent clergymen and laymen encouraged the prosecution. A special court was appointed for the hearing of the cases, but the trials were a mere mockery. Nineteen persons, among them some of the most pious and reputable citizens, were hanged. Six were men, including one clergyman, and thirteen were women. Giles Corey, for refusing to plead, was pressed to death.

A reaction in public sentiment now began to set in, and though at a court held in 1693 three persons were condemned, no more executions took place. See MATHER, COTTON.

In Europe in the sixteenth century no crime was more common. A single judge in Lorraine boasted of having sentenced 900, and he was still active. If the persecution knew fiercer epidemics in Catholic communities, it was more chronic in Protestant, and it lingered on, especially in lands where (as in Catholic Spain and S. Germany, or in Protestant Scotland and Switzerland) a literal faith in the Bible had rooted it firmly in religion. "The giving up of witchcraft," wrote even the reformer John Wesley in 1768, "is in effect giving up the Bible." The latest legal witch executions in Europe were at Kempten, Bavaria, in 1775; at Glarus, Switzerland, in 1785; and in the grand duchy of Posen, in 1793; but witches were judicially burned in Mexico as late as 1873.

Witch'-hazel, or **Hamame'lis Virgin'ica,** indigenous shrub belonging to the order *Hamamelaceæ;* is found in damp woods and by streams in many parts of the U. S.; grows from 5 to 15 ft. in height. The bark yields a sedative used both internally and externally for the purpose of controlling hemorrhage and for influencing diseased blood vessels, as, for example, dilated veins.

Witenagemot (wĭt'ĕ-nă-gĕ-mōt), "assembly of wise men," the old Saxon national council, the great court of justice and supreme legislative body of the English nation before the Conquest, superior to the scir-gemot or county assembly, and itself the offspring of the primitive folkmote, an old Germanic institution. The ealdormen, the high ecclesiastics, and the great landholders, as well as the higher shire officers, appear to have had seats in the witan, or witenagemot; and probably the freemen who lived near the place of meeting were allowed to sit in the assembly. It elected the king, observing, however, the principle of hereditary succession, though not necessarily choosing the eldest son, and it possessed the right of deposition. Its powers included the making of treaties, the appointing of bishops, the regulation of military and ecclesiastical affairs, the raising of revenue, etc., but its functions differed in different reigns, and cannot be clearly defined, nor is it easy to trace the descent of the later English Parliament from this council, though in some points there is a close resemblance. The witenagemot was abolished by William the Conqueror, who, however, had previously secured its acknowledgment of his title.

With'erspoon, John, 1722–94; a signer of the American Declaration of Independence; b. Yester, Scotland; became minister of Beirth when at Paisley, Scotland. In 1768 became president of the College of New Jersey, at Princeton; 1776, member of Provisional Congress of New Jersey and Continental Congress, at Philadelphia. He represented New Jersey in Congress for six years, and showed great political sagacity.

Wit'ness. See EVIDENCE and TRIAL.

Witte (vĭt'tĕ), **Count Sergius de,** 1849– ; Russian statesman; b. Tiflis; educated Univ. of Odessa, and graduated, 1870, at Novorassisk Univ. He entered the railway service, and was director of the SW. railways, 1886–88; president tariff commission, 1889; Minister of Ways of Communication, 1892; then Minister of Finance till 1903; Secretary of State, 1896; Privy Councilor, 1899. In 1903 he became president of the Committee of Ministers and a member of the Council of the Empire; Prime Minister of Russia, 1905–6. In the negotiations which led to the Treaty of Portsmouth his diplomatic ability led to the abandonment by the Japanese of their claim for a war indemnity and other disputed points.

Wit'tekind, or **Wid'ukind,** leader of the Westphalian Saxons in their wars with Charlemagne. When most of the Saxon chiefs submitted to Charlemagne at the Diet of Paderborn (777), Wittekind fled to Jutland, but returned in 778, while Charlemagne was in Spain, and renewed the war in the Rhine countries. Charlemagne hastened to Germany, and Wittekind was once more compelled to flee to Jutland. In 782 he again returned, and annihilated a Frankish army in the Süntel Mountain on the Weser. Charlemagne took a cruel revenge by massacring 4,500 Saxons at Verden on the Aller, but this cruelty occasioned a general rising of the Saxons under Wittekind and Albion. They were defeated, however, at Detmold and on the Hase in 783, and the two chiefs fled to Holstein. Nevertheless, in 785 a reconciliation took place between the emperor and his two great antagonists; they repaired to his camp at Attigny in Champagne, and were baptized, after which event their career is legendary.

Wittenberg (vĕt'tĕn-bĕrkh), town; province of Saxony, Prussia; on the Elbe, 55 m. SW. of Berlin. It is famous as the place where the Reformation began. The houses of Luther, Melanchthon, and Lucas Cranach are still shown; also the spot, outside the Elster gate, where the papal bull was burned. Luther and Melanchthon are buried in the Schlosskirche. The university, once so famous, was incorporated with that of Halle in 1817. Breweries, distilleries, and tanneries are in operation, and woolen and linen goods made. Pop. (1900) 18,345.

Witwatersrand (vĭt-vä'tĕrs-ränd), or **The Rand** (literally, "White Water Range"), a range of heights in the Transvaal Colony, S. and SW. of Pretoria, which since 1886 has been the greatest gold-producing region in the world. It is conservatively estimated that the "banket" reef or outcrop will yield $3,500,000 down to the 5,000-ft. level. See JOHANNESBURG.

Woad (wōd), a biennial herby plant of Europe, which has been employed from the times of the Romans for dyeing blue, though now replaced by indigo, which gives a better color. It is cultivated in France and Germany. The leaves possess a pungent odor and an acrid taste. These are either simply dried and sent to market, or by grinding are made into a paste, which is then prepared into balls and allowed to ferment, after which it is dried. Woad does not appear to contain either indigo white or indigo blue (see INDIGO), its coloring qualities being due to the presence of a body termed *indican*. At present it is chiefly used for the reduction of indigo in the "woad vats," but is seldom employed by itself for dyeing.

Wo'den, or **Wodan.** See ODIN.

Wol'cot, or **Wolcott, John,** better known as PETER PINDAR, 1738–1819; English physician and satirical poet; b. Dodbrooke, Devonshire; served an apprenticeship of seven years to his uncle, a physician, who ultimately left him a considerable property; accompanied Sir William Trelawney, Governor of Jamaica, to that island as his physician, 1767; took orders in the Church of England, and obtained a curacy in Jamaica in 1769, but returned to England on the death of his patron three years later; spent twelve years at Truro, Helston, and other towns in Cornwall as a physician; discovered the merits of the obscure painter Opie, with whom he went to London, 1780; made himself conspicuous by his poetical productions, mostly satirical, which involved him in many quarrels. His attacks upon the king were so effective that at one time the ministry purchased his silence by the payment of £300 per annum. Among his satires are "Lyric Odes," "An Epistle to the Reviewers," "Peeps at St. James," "Royal Visits," and "The Lousiad." In his later years he became totally blind.

Wolf, the common name for the larger wild species of the family *Canidæ* and genus *Canis* which most resemble the dog, and which agree with the ordinary types of that animal in the possession of circular pupils to the eyes and a somewhat bushy tail. The species are numerous, and the typical representatives are chiefly found in the N. hemisphere and southward to India; but allied species, which are properly called wolves, although more generally designated as wild dogs or foxes, are also found in Africa, S. America, and Australia. They agree essentially in their habits with the dogs, and hunt their prey either by surprising or running it down. At some seasons of the year they live, to some degree, in solitude, although they often associate in packs; and especially is this the case in winter, when they combine in the pursuit of prey. In America there are two well-marked species: (1) The large common wolf, identical with or a subspecies of the wolf of Europe and N. Asia; and (2) the small prairie wolf or coyote, occurring on the W. plains. The former has an average length of about 4 ft., with a tail of 17 to 20 in.; its color is grizzly gray above, but is variable, sometimes being black and sometimes white, with various gradations. The prairie wolf is about 3 ft. long or somewhat longer, and has a tail about 16 in. Its color, as in the wolf, is generally gray. It is found more generally on the plains of the great West and in the basins of the Missouri and Saskatchewan rivers, and extends S. into Mexico. It is prolific, sometimes having as many as ten in a litter. It lives mostly in burrows. The Tasmanian wolf is a marsupial.

European Wolf.

Wolf Dog, a large variety of the domestic dog, allied to the shepherd's dog, now found almost exclusively in Spain, though formerly common in Ireland and Scandinavia. The name is also applied to a dog of any kind that is trained to protect sheep, etc., against wolves.

Wolfe, James, 1726–59; English soldier; b. Westerham, Kent; entered the army as second lieutenant at an early age; present at the battles of Dettingen, Fontenoy, Falkirk, and Culloden; distinguished himself at Lafeld, 1747, and at the siege of Maestricht, 1748; commanded a regiment in the Highlands of Scotland, 1749–54; quartermaster general in the expedition against Rochefort, 1757, and brigadier general in that against Louisburg, Cape Breton, 1758; appointed by Pitt major general, and placed in command of an expedition for the conquest of Canada, 1759; arrived with 8,000 men in the St. Lawrence in June; was repulsed by Montcalm in a first attack, July 31st, and fell in the moment of victory in the battle on the Plains of Abraham, September 13, 1759.

Wolf Fish, fishes of the genus *Anarrhicas*, so named from their fierce aspect and large canine teeth. They are long but stout fishes. The species are peculiar to the N. seas. The best marked, and possibly the only ones, are found on both sides of the Atlantic and along Greenland. On the American coast the wolf fish is found as far S. as Cape Cod, and occasionally even beyond. It is a ravenous and ferocious fish, and with its powerful jaws can inflict a severe wound even on man. Although repulsive in its appearance, and rarely, if ever, eaten on the American coast, it is regarded as palatable or even excellent food in Europe. The skin is used for bags and pockets. The wolf fish occasionally attains a length of 6 or 7 ft. It mostly lives in deep water, but approaches the shore to deposit its spawn in May and June. This species is also called in various places sea wolf and catfish, and in the Orkneys swine fish, on account of the movements of its nose, which are supposed to simulate those of a hog.

Wolfs'bane. See Monkshood.

Woll'stonecraft. See Godwin, Mary Wollstonecraft.

Wolse'ley, Garnet Joseph (first Viscount Wolseley), 1833– ; English military officer; b. near Dublin, Ireland; entered the British service as ensign, 1852; served in the Burmese War, 1852–53; with Sir John Cheape's expedition against the robber chief Myattoon; in the siege of Sevastopol from 1854 to close of the war; in the suppression of the Indian Mutiny, 1857–59; and in the war with China, 1860. In 1870, in command of the expedition from Canada to the Red River territory, he suppressed the insurgents at Fort Garry. In 1873 he was Governor of Gold Coast Settlement, which had become involved in a war with the Ashantees, and defeated the enemy's army, occupied and destroyed Coomassie, his capital, and the king's palace, and brought the war to a speedy and successful end. For these services he was made major general, and the thanks of Parliament and £25,000 were bestowed upon him; Governor of Cyprus, 1878, and of Natal, 1879; commander of British forces in Egypt, 1882, winning the battle of Tel-el-Kebir, which practically closed the war; raised to the peerage as Viscount Wolseley, and made general in 1882; in 1884–85 he was commander in chief in Egypt, and conducted operations for relief of Khartoum. In 1890 was commander in chief of the troops stationed in Ireland, with headquarters in Dublin; from 1895 till 1900 he was commander in chief of the British army with limited powers. He is the author of several military works, as "The Soldiers' Pocket Book for Field Service," and biography of the Duke of Marlborough.

Wolsey (wŏl'zĭ), **Thomas**, 1471-1530; English cardinal; b. Ipswich, England; educated Magdalen College, Oxford; received in 1500 the rectorship of Lymington; was a chaplain to Henry VII, 1505; went to Bruges in 1507 on a special diplomatic mission to the Emperor Maximilian, and to Scotland, 1508, on a similar errand, and for his success was rewarded with the deanery of Lincoln, 1509. Henry VIII made him his almoner, 1509, and soon employed him in the most important affairs. He made him Archbishop of York in 1514, Lord Chancellor of England in 1515, and showed him an almost unlimited confidence. Foreign princes courted his favor; the Emperor and the King of France sent him great presents and bestowed pensions on him; the pope created him a cardinal in 1515, and legate in 1519; and from this last year to his fall he acted as if he were really the ruler of England. Wolsey's income was royal, but was nobly expended. He built Hampton Court; he founded Christ Church College and seven lectureships at Oxford, and was a liberal patron of letters, and especially of the new learning. In personal bearing he was haughty and arrogant toward his equals, adroit in managing his superiors, and kind and generous toward his inferiors.

Twice—on the death of Leo X (1522) and again on that of Adrian VI (1523)—the papal tiara seemed to be within his reach, but both times his plans were foiled by the intrigues of Charles V and by the opposition of the French bishops. At last his ambition came into conflict with the king's passion. The king wished to have his marriage with Catharine of Aragon annulled by the pope, and on Wolsey devolved the obligation of carrying through the negotiations. The task was a thankless one, and Wolsey realized its hopelessness. The king lost his patience, and even began to distrust the cardinal. At last it was evident that Wolsey had failed. The pope, Clement VII, absolutely refused to grant the divorce. Wolsey was not sorry at his own failure in the matter, because he was opposed to Henry's marriage to Anne Boleyn, since it might endanger his own position at home by giving the widespread jealousy and enmity around him a firm center. At last Anne Boleyn demanded and obtained from the king the cardinal's dismissal in disgrace, and in 1529 the great seal was taken from him, and he left the court. He retired to his archbishopric, and seemed prepared to end his life in comparative obscurity. But the hatred of his enemies was not yet satisfied, and in 1530 he was arrested on a charge of high treason. He was conducted to London, but on the way thither he fell ill, and died at the monastery of Leicester.

Wolverene'. See GLUTTON.

Wom'an's Chris'tian Tem'perance Un'ion (in abbreviated form W. C. T. U.), an association to unify throughout the world the work of women in temperance and social reform. Its methods are preventive, educational, evangelistic, social, and legal; the time of prayer observed by its members is noontide; its badge is a knot of white ribbon; its watchwords are "Agitate! Organize." Its motto is "For God and home and every land."

The National Woman's Christian Temperance Union was organized in Cleveland, Ohio, in 1874, and is now regularly organized in all the states of the Union. Its headquarters are in Evanston, Ill., where it has a temperance publishing house which sends out about 135,000,000 pages annually, and has seven editors and 150 employees. This publishing house is a stock company, and all its directors and stockholders are women, as is its business manager. The *Union Signal* is the organ of the society. The Woman's National Temperance Hospital demonstrates the value of non-alcoholic medication. The Woman's Temperance Temple, which cost over $1,000,000, has been built in Chicago. There are about 10,000 local unions with a membership and following, including the children's societies, of about half a million. The Woman's Christian Temperance Union has forty-four distinct departments of work. The laws requiring the study of scientific temperance in the public schools were secured by the Woman's Christian Temperance Union, as were also the laws forbidding the sale of tobacco to minors. Most industrial homes for girls were secured through the efforts of this society, also the refuges for erring women; laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through its influence.

Woman's Suf'frage. See SUFFRAGE.

Wom'bat, a marsupalian quadruped, of which only three species are known. It is of clumsy form and stout limbs, reaching a length of about 3 ft. and a weight of 60 lb. The legs are short, but powerful, and the animals burrow readily. The general color is gray, lighter beneath. They are nocturnal in habits, feed on vegetables, and, as a rule, are easily tamed. The common wombat is found in S. Australia, New S. Wales, and Van Diemen's Land. The broad-fronted wombat is a native of S. Australia.

WOMBAT.

Won'ders, Sev'en. See SEVEN WONDERS OF THE WORLD.

Wood, the hard and compact or tough and fibrous parts of higher plants, chiefly composed of fibrous and vascular tissue. It is found in the stems and roots. Annual plants usually contain little woody fiber. Wood is valuable not only as timber and fuel, being in many parts of the world the chief, if not the only, fuel, but to the woody fiber we are also indebted for cordage, many textile fabrics, etc., and, reduced to pulp, it is used for making paper. A kind of artificial wood used for making ornamental articles was invented in France, and is known under the name of *bois duré*. It is formed of sawdust heated to a high temperature, and subjected to a very great pressure. Its compactness and hardness exceed those of wood itself. See FORESTRY; PRESERVATION OF TIMBER; TIMBER AND TIMBER TREES.

Wood Al'cohol. See ALCOHOL.

Wood'bine, a name given in Europe to the honeysuckle, and in the U. S. to the Virginia creeper. See AMPELOPSIS; HONEYSUCKLE.

Wood'carving, sculpture in wood. Many kinds of wood afford excellent material for sculpture. Some hard and close-grained woods, such as box, holly, mahogany, pear, linden, and those of several Oriental trees, are fit for the most minute and delicate carving. Except on a small scale it is not necessary to seek for woods having an exceptionally fine grain. It is often found that the grain adds a charm to the work—not merely the lines of the veining, as in the case of ivory, but even the open pores as they are cut across at different angles. Thus of all woods oak has been the most employed since the tenth century for all kinds of sculpture, and there is no wood so fit for it and so beautiful, as is shown in the stalls and confessionals of hundreds of churches throughout Europe. Chestnut is excellent, and is much used for coarser work. Walnut has been much used, especially for carved furniture and the like, and in the S. of Europe. Sycamore wood, the use of which for large pieces of sculpture is traditional in Europe from the earliest times, seems to have been but little employed in the Middle Ages. The wood of the ancient acacia is recognized as having been employed in important sculptures of the earliest times. The beauty of the wood when finished was less thought of because sculpture in wood, like that of stone, was generally covered with painting, and often gilded.

Wood that is to be used for artistical carving should receive a special treatment fitting it for its purpose and adding to its durability. One expedient much used in ancient times was smoking in wood smoke. This, of course, was not used until the wood was well seasoned. It is a custom, still observed in the few cases where delicate carving is to be done, to glue pieces of paper upon the ends of the piece of wood and covering the end grain; such wood may then be thoroughly dried even in hot rooms, without checking, the drying out of the sap taking place equally along the whole length of the wood and not rapidly at the ends. Most workmen of the best class have secrets for the preparation of wood; but the cost of fine work has become so great in modern times that it is very rare that a piece of furniture is undertaken with every precaution for the highest excellence. The soft wood of the common pine trees lends itself well to carving on a large scale, and is particularly good for out-of-door work which is to be painted. These woods might equally well be used even where the surface is not to be painted, as may be seen in the curved and pierced panels of Japanese temples and dwelling houses. Some of those panels are 3 in. or more thick, and are carved in animal and vegetable forms and with legendary subjects, even involving the suggestion of landscape with mountains and clouds, the carving being carried deep into the wood so that parts of it are pierced through. The domestic architecture of India includes a great deal of effective wood carving, the pieces being often very large and covered with minute flower and leaf sculpture. In this Indian work carving is used in excess, all parts being equally covered with it. It is frequently painted in rich colors, rather for ornament than for preservation.

The earliest piece of woodcarving which we know is also perhaps the earliest piece of sculpture known. This is the Egyptian statue called the Sheikh-el-Beled or "village chief," so named by the natives when first discovered—the life-size statue of a short and stout man, apparently of sycamore wood, and dating from about 4,000 years B.C. Woodcarving of the Greeks is not known, but it is certain that many of the sacred statues, regarded with great veneration throughout classical antiquity, were of wood. Classical Roman sculpture in wood has also perished. There is little hope of finding well-preserved wooden articles in tombs or otherwise buried in a climate and soil less dry than those of Egypt.

It is with the later Middle Ages that the finest woodcarving is associated. The stalls and other fittings of the choir in the Church of Ratzeburg, near Lübeck; those in Notre Dame de la Roche, near Paris; those of the Cathedral of Auch, and especially those of the Cathedral of Amiens, are specimens of the most admirable detailed carving of men and animals, foliage and the like, all combined in a semi-architectural design of great dignity and importance. Larger carvings were used for the wooden structural parts of churches and other buildings. Of these almost nothing remains except the English open timber roofs, and the ends of the hammer beams in Westminster Hall, carved into angels holding shields, are good instances of the kind of work which was put upon such architectural members.

The portable furniture of the same epoch, French, German, Italian, and English, though but few pieces remain, gives us an excellent example of elaborate carving used for the adornment of the simplest and most natural forms. The furniture makers of the Middle Ages used only very simple methods of putting together the parts of their benches and tables, but decorated the members by skillful cutting away of the wood in picturesque curves where comparative thickness was not needed, and by carving of leafage and animals wherever their forms could be introduced as part of the general design. Woodcarving was used also for images of the sacred personages of Christian theology, both small and portable, and of large size in connection with the altar, the rood screen, etc.

In all the times and places of a free use of woodcarving, the art grows to be familiar and the mechanical process easy and rapid beyond the conception of those who have only seen it done to order in an inartistic and commercial community. Thus in France, where old traditions still partly remain undisturbed, very interesting and spirited carving in oak is done at a price surprisingly low, and yet done by men who are well-to-do citizens earning a good living. Some of these men have also a good knowledge of certain styles of art, and can do " Louis XIII " or " Louis XV " work without special study or preparation. In all this work it is noticeable how simply it is done; how few cuts, how few minutes have gone to the shaping of a leaf or a bunch of leaves. At present, and especially in the U. S., the demand is restricted to delicate and highly finished work. Moreover, there are fewer competent woodcarvers in a great city like New York than there are in many a French town of one twentieth its size.

Wood'chat, a shrike of the Old World which has a very wide geographical range. In S. Africa it is called " magistrate bird," from its habit of impaling and hanging its victims. It is sometimes named the " red nine-killer," from the belief that it kills nine victims before it begins to eat.

Wood'chuck, or **Ground Hog,** a large rodent mammal of N. America, quite common in the E. portions. It is about 18 in. long, and has a grizzled reddish-brown fur, which has a limited industrial use. The creature is very prolific, eats clover, young cabbages, and beans, hibernates in cold weather, and is sometimes used for food. It digs a deep burrow.

WOODCHUCK.

Wood'cock, either of two different game birds of the snipe family. The European woodcock ranges over the E. continent from Japan to the British Isles, and attains a length of 14 in., while the American bird, which attains only 11 in., is found abundantly in the N. U. S. and in Canada. The plumage is a warm brown with gray and black markings. The eye is placed high up toward the hinder part of the head. Both are prized for the delicacy of their flesh. The food of the woodcock consists mostly of worms, which it obtains with skill, thrusting its beak as far as the nostrils into the soft, moist earth. A tame woodcock has been seen to probe large turfs with its bill, and to draw out a worm at every thrust of the long, slender beak. It is thought that the sense of smell enables the bird to discover the worms. It moves about chiefly on misty days, and is said by experienced woodcock shooters to prefer the N. side of a hill to the S. It is a very silent bird, seldom uttering a cry except when first starting for its feeding places, and hardly ever crying when flushed. The flight of the woodcock is wonderfully swift, although the wings do not appear to move very fast.

Wood Duck, or **Sum'mer Duck,** a beautiful bird related to the still more beautiful mandarin duck of China. The wood duck has the head green, glossed with purple, with a line from the upper corner of the bill, one from behind the eye, and two bars on the side of the head and upper part of throat white, the tail at sides purple, the under parts white, the sides yellowish, banded with black, and the back uniform with various reflections. It is about 19 or 20 in. long. The species ranges over most of N. America—in the warmer regions as a permanent resident and in the N. as a summer migrant. It builds its nest generally in a hollow tree. Its eggs are smaller than a hen's, and have surfaces like polished ivory. It is generally seen in pairs, and rarely in flocks of more than three or four. It feeds chiefly on acorns, the seeds of wild oats, and insects. The flesh is tolerably good food.

Wood Engrav'ing. See ENGRAVING.

Wood'en Horse, in ancient tradition, an artifice of the Greeks which ended, successfully for them, the long siege of Troy. The besiegers, as if discouraged, withdrew from Troy to Tenedos, leaving outside the city walls a large horse built of wood and filled with chosen warriors. Priam, persuaded by Sinon, a pretended deserter from the Greeks, that the horse was an offering to Minerva, and disregarding the protest of Laocoön, received the horse within the walls, and at night the armed Grecian chiefs, set free by Sinon, set fire to the city.

Wood Grouse. See CAPERCAILZIE.

Wood'pecker, popular name for the birds of the family *Picidæ* on account of their habit of cutting, or pecking, into trees either in search of food or to build their nests. The woodpeckers are mostly of moderate size, ranging from the great Mexican *Campophilus imperialis*, which is 22 in. long, to the little downy *Picus pubescens* of 6 in. Though not, as a rule, bright-colored birds, many species have a plumage which is striking from its sharp contrasts of black and white, heightened by the red, crescent-shaped nape mark. Some species have conspicuous crests, and others, like the flickers of N. America, have considerable red or yellow about them; but this is so blended as not to be glaring. Woodpeckers live largely on ants, grubs, and other insects, as well as on fruit and vegetable food. The tongues of the majority of species form effective spears for impaling wood-boring grubs, whose burrows are cut into by the strong bill. In other species, like the flicker, the tongue is used for probing ant-hills, or picking these insects from the ground, being plentifully besmeared with saliva. The sapsuckers have comparatively short and brushy tongues. The California woodpecker stores up acorns in holes cut into dead branches, and scores may be seen imbedded in one limb. A woodpecker's eggs are six to nine in number, white, glossy, and translucent.

There are between 250 and 300 species of woodpeckers distributed over the greater portion of the globe, save Madagascar and the Australian region, except Celebes and Flores. About half this number are American, and twenty-two species and thirteen subspecies occur in the U. S. One of these, the ivory-billed woodpecker, is in danger of being exterminated, being limited to the wilder parts of Florida in the E., although still found sparingly in some parts of the SW.

Wood'ruff, a favorite herb of the European peasants. It has, when dry, a pleasant odor, somewhat like that of the Tonquin bean or sweet clover. The Germans put it into their May drink (*Maitrank*) and intó home-made beer. In America *Galium triflorum*, a related plant with a similar smell, is used as a substitute.

Wood Swal'lows, or **Swift Shrikes**, a group of birds slightly resembling swallows in habits and appearance, but belonging to the subfamily *Artamidæ*. In the E. Indies and Australia they abound. The *Artamus sordidus*, an Australian species, has the habit of forming clusters like those formed by honeybees on their hives, the whole flock clinging together, and sometimes forming a mass as large as a bushel basket. They eat insects and seeds, and are somewhat migratory in their habits.

Wool, John Ellis, 1784-1869; American soldier; b. at Newburg, N. Y. He was commissioned as captain of the Thirteenth Infantry, 1812; distinguished himself in the War of 1812, and in 1816 appointed inspector general, with the rank of colonel. In the war with Mexico he superintended the organization of W. volunteers, and, after dispatching some 12,000 to the seat of war, conducted himself a force of 3,000 on the march from San Antonio to Saltillo and joined the army of Gen. Taylor as second in command. Held other important commands, and promoted to be major general, 1862; was retired 1863.

Wool and Wool'en Manufac'tures, the fleece of the sheep and the processes by which it is converted into fabrics. The term wool, however, has been extended to include the covering of several other animals. Wool proper may be distinguished from all other varieties by the character of its fibers and by its property of felting, due to the scales which overlap and form a felted fabric (see FELT). A large number of scales improves the elasticity and the felting property. The primitive sheep was covered with long hair, the rudiments of the present fleece being an undercovering. The hair was bred out, but if sheep are neglected now, or become very old, they will revert to this habit. Sheep formed a large part of the wealth of the Oriental nations, the people of which produced delicate and exquisitely fine fabrics.

The first attempts to improve the breeds of sheep were made by the Romans about the second century B.C., when they crossed their Tarrentine sheep with white African rams, the progeny producing a breed of fine-wooled sheep, yielding a heavy fleece. This cross is supposed to be the original of the Spanish merino sheep. Careful improvement in France led to the production of French merino, one of the finest of the long-wool breeds. Its introduction into Germany has produced the fine Saxon wools, and the French sheep of Naz, which yields a silky wool, bears traces of its early merino origin. In the U. S. the Spanish merino has exerted a wide influence, and, together with the Saxony sheep, the sheep of Naz, and the French merino, constitutes the largest proportion of those flocks which are bred mainly for their wool.

Wool is divided into pulled and clipped or fleece wools, the former being pulled by the roots from the pelt of the dead animal and the latter clipped from the living one. The clipped wools form the greater part of the wool in market, and these are again divided into long and short staple, or combing and clothing wools. The quantity of wool grown increased rapidly during the nineteenth century, especially in Europe, America, Australia, and S. Africa. Since 1901, when it was 138,000,000 lb., the production of wool in Great Britain has decreased, being for 1909 133,705,074 lb. In most European countries the production has fallen off considerably. Australasia produces the finest wool in the world for fine combing purposes, the output for 1909 being estimated at 756,590,163 lb.

In the U. S. the demands for wool for home manufactures have immensely increased the production, while the amount imported (1909) was nearly 266,500,000 lb., valued at $45,000,000. In 1810 the wool produced in the U. S. was estimated at 13,000,000 lb.; 1890, 309,474,856 lb. In 1908 the production was 298,294,750 lb. The average annual consumption of wool in the U. S. (1899-1909) was about 475,000,000 lb., of which over one third was imported. The world's supply was 955,000,000 lb. in 1860 and 2,456,773,600 lb. in 1890. The production in 1909 was as follows:

North America	345,320,749 lb.
Central America	5,000,000 lb.
South America	436,716,000 lb.
Europe	804,905,074 lb.
Asia	210,399,000 lb.
Africa	139,702,000 lb.
Australasia	756,590,163 lb.
Oceanica	100,000 lb.
World's supply	2,695,732,986 lb.

The principal European markets for wool are at London and Antwerp.

The manufacture of wool into fabrics for clothing is one of the oldest industries. At a very early date the primitive woman discovered that the coarse wool of the sheep could be made to serve as a substitute for the pelts of the sheep. Although the transition to garments of more skillful workmanship was gradual, the production of dyed garments, of shawls, and of carpets was attempted at a very early period. Some of the Persian, Greek, and Roman cloths must have been very beautiful; but in the ages which followed the downfall of the W. Roman Empire the art of making them was nearly lost, the says and serges of the Middle Ages being made from coarse and harsh wools. After the thirteenth or fourteenth century, silks, satins, and velvets became the favorite clothing of the wealthy.

Until after the Reformation the making of woolen goods was almost entirely domestic, and the assembling of looms and spinning wheels in a single building gave some advantages. The dyeing and fulling of the cloths was a separate business, and, as water power was required for this, fulling mills sprang up. There were frauds in those days—stretching of the goods and the extravagant use of flocks—shorn fibers, or the nap, cut from the face of one piece of cloth, then fulled into the back of another piece. If judiciously used, they improve the fabric. From the end of the thirteenth century to the end of the seventeenth century this domestic manufacture of cloths was carried on extensively in England, and much was exported. Though large quantities of goods were made in the eighteenth century, their quality was far from uniform, and there was no improvement in processes until the invention of the carding machine, about 1753, and the spinning jenny. The gradual introduction of these machines and the application of steam greatly improved the character of the English and French cloths, but until the introduction of the power loom (abt. 1800) and the Jacquard loom (invented in 1811) the woolen and worsted manufactures had not received their greatest impulse in Great Britain. The French manufacturers, with their fine and soft wools, directed their attention to the production of fabrics for women's wear, and their merino goods have never been surpassed.

In the U. S. the manufacture of woolen goods was almost entirely domestic as late as 1790, and, though there had been fulling mills from the first settlement of the colonies, there was no woolen factory in successful operation before 1794. In 1812 a large factory of fine cloths was established at Middletown, Conn., and in the same year were produced the helicoid shears, a cutting machine with spiral blades on a cylinder acting against a straight steel blade, and shearing the nap of the cloth evenly and perfectly. Although this was first adopted in France, the world is indebted to the U. S. for some of the best inventions in the manufacture of wool. Massachusetts has from the first maintained the leading position in wool manufacture, her production amounting in 1907 to $132,930,300. Pennsylvania, New York, Connecticut, and Rhode Island are the other largest producers.

The variety of goods wholly or in part made of wool, or of worsted, is so great that the processes to which each is subjected in its manufacture can be named only in the most general way. The distinction between the woolen and worsted goods begins in the character of the wool used. For all heavy wool goods a fine, short-stapled, and readily felting wool is required; for worsted goods the wool must be strong in fiber, of long staple, not very fine, and freed from the noil, or short fiber, which is afterwards mixed with wool, carded, and spun for felted goods. The wool is first sorted and scoured. The sorter arranges the parts of each fleece according to fineness, length of staple, and silkiness of texture, and the scouring is accomplished by throwing the wool into large tanks filled with water and soap, keeping it at a high temperature, and continually moving it. When thoroughly cleansed, the wool is drawn out through rollers, and then dried by revolving fans. By this scouring and washing not only is the dirt and soil removed from the fleeces, but the yolk or suint—a peculiar fatty secretion of the sheep—is also discharged. The British makers extract these matters from the water by a chemical process, and make *dégras*, a low form of grease, from the product. The wool is next dyed, if it is necessary to dye it in the wool. The next process is willying, or in the case of W. and S. American wools, burring, to remove seeds and burs entangled in the wool. The American burring machines of various kinds do this perfectly and in combination with the carding machine. Picking, teasing, or moating is the next process, by a machine which tears open the matted portions and separates the wool into small tufts. Either before or immediately after this process the wool is oiled. The wool is now ready for the carding and slubbing processes. Their office is to convert the wool into rolls, which are drawn out before they are spun. The spinning is the next process, and herein is another difference between woolen and worsted yarns, the yarns for woolen cloths being but slightly twisted, so as to leave them more free for felting, but those for the warp twisted more than those for the weft, as they have to bear more strain; while the worsted yarns are hard spun and made into a much stronger thread. The slight twisting and comparative lack of strength in woolen yarn renders it more difficult to weave on a power loom than the worsted, cotton, silk, or linen yarns. The yarn, when spun, is reeled, and, if to be made into cloth, warped, beamed, sized, and otherwise prepared for weaving. The weaving is generally done on an ordinary power loom for broadcloths, flannels, etc.; on a Crompton chain loom for fancy cassimeres, yarns of different colors being introduced; or on the Earnshaw needle loom, where the goods are made with two faces of different colors. Most woolen goods are next scoured to remove the oil, and then, if necessary, dyed again, and tentered, or stretched, to dry. Burling, or picking off irregular threads, hairs, and dirt, succeeds this, and then, for the cloths, come the fulling process and the teaseling or raising the nap. It is next steamed or scalded and pressed between polished iron plates in a press. Carpets are made from coarser wools, and do not go through so many preliminary processes; they are woven on the Bigelow carpet looms.

Wool'sey, Theodore Dwight, 1801-89; American educator; b. New York; graduated at Yale, 1820; read law; studied theology at Princeton; was a tutor in Yale, 1823-25; licensed to preach, 1825; studied languages abroad, 1827-30; Prof. of Greek in Yale, 1831; president, 1846-71; edited various Greek classics and published "College Education," "An Introduction to the Study of International Law," "An Essay on Divorce and Divorce Legislation," "Civil Liberty and Self-Government," and a "Manual of Political Ethics." Pres. Woolsey was for several years one of the regents of the Smithsonian Institution, and was a member and the chairman of the American division of the committee for the revision of the New Testament. He published a work on "Political Science," 1877, and on "Communism and Socialism," 1879.

Wool'sorter's Disease'. See ANTHRAX.

Wool'wich, town, county Kent, England; on the Thames; 9 m. below London Bridge. It extends for a distance of 2 m. along the river. This is also the seat of the chief arsenal of England, and contains all the workshops in which cannons, bombs, shells, etc., are made. It has the Royal Military Academy and extensive barracks. Woolwich is now a part of London. Pop. (1901) 41,607.

Woonsock'et, city (incorporated 1888), Providence Co., R. I.; on the Blackstone River; 16 m. N. by W. of Providence and 37 m. SW. of Boston. It is a consolidation of what were isolated factory villages; hence its streets are irregular, but not without beauty. The river is here crossed by a magnificent bridge. The leading industries are cotton, woolen, and rubber manufactures. Besides these, there are several machine shops, a sewing machine, wringing machine, shuttle, reed, harness, and bobbin factory. Pop. (1906) est. at 32,994.

Woorari (wô'ră-rĭ), or **Woo'rali.** See CURARE.

Woos'ter, David, 1710-77; American general; b. at Stratford, Conn.; graduated at Yale College, 1738; commanded a sloop of war in the expedition against Louisburg, 1745; went to Europe in charge of a cartel ship; visited England; was presented at court and made a captain in Pepperell's regiment; was appointed colonel of the Third Connecticut Regiment, 1755; served as brigadier general in the N. campaigns of 1758-60; was one of the originators of Arnold's expedition for the capture of Ticonderoga, 1775; was appointed brigadier general, 1775; succeeded to the command in Canada on the death of Montgomery; became major general of state militia, 1776; mortally wounded in the defense of Danbury against Tryon.

Worcester (wos'tĕr), **Joseph Emerson,** 1784-1865; American lexicographer; b. at Bedford, N. H.; graduated at Yale College, 1811; taught school at Salem, Mass.; studied theology two years at Andover Seminary; settled at Cambridge, Mass., 1819, and devoted himself thenceforth to the preparation of a series of valuable text-books and of his dictionary, for which purpose he visited Europe, 1830-31. Among his works were several on historical and geographical subjects; "The American Almanac," 1831-43; a revised edition of Todd's "Johnson's Dictionary," 1828; an abridgment of "Webster's Dictionary," 1829; "Comprehensive Pronouncing and Explanatory Dictionary of the English Language," 1830; "Universal and Critical Dictionary," 1846; and his great work, "A Dictionary of the English Language," 1860.

Worcester, capital of Worcester Co., Mass.; on the Blackstone River; 44 m. W. of Boston. The settlement, begun in a valley, has spread over and beyond adjacent hills, and the natural advantages for beauty, health, and convenience are unsurpassed. The principal business thoroughfares are Main Street and Front Street. There are eleven public parks, aggregating 360 acres. The city is divided into eight wards, the boundary lines of which diverge from the center like the spokes of a wheel. The government is vested in a mayor, nine aldermen, and a common council of twenty-four members. Worcester possesses few striking specimens of architecture. The schools of Worcester are noted for their excellence. The higher educational institutions are the Roman Catholic College of the Holy Cross, the Polytechnic Institute for practical training, the state normal school, the Worcester Academy, Clark Univ., and Clark College. The city hospital, the Washburn Memorial Hospital, and St. Vincent's Hospital are well endowed. There is also a homœopathic hospital and several private ones. Two state hospitals for the insane are located here. The state Odd Fellows' home was opened in 1892, and there are many charitable establishments. The county jail is the only penal institution. Worcester produces a greater variety of manufactured articles than any other city in the U. S. Its wire mills are the largest in the world, employing 2,000 persons. Loom manufacture comes next. One third of the envelopes used in the U. S. are made here. The boot-and-shoe industry is large. Every kind of machine used in a woolen or cotton mill is made here.

Worcester was first settled in 1675 under the name of Quinsigamond Plantations. The pioneers were soon driven away by the Indians and their buildings destroyed. A second settlement in 1684 met the same fate. In 1713 the third and permanent settlement was made. The first church was organized in 1719, and the town was incorporated in 1722. In 1775 Isaiah Thomas removed his press from Boston to Worcester, and, 1790-1800, carried on the most extensive publishing business in the U. S. From the steps of the old South Church the Declaration of Independence was read for the first time in Massachusetts. The opening of the Blackstone Canal in 1828, and of the railways which superseded it, caused the town to grow rapidly, and it was incorporated as a city in 1848. From its central situation in the state, in its richest agricultural section, Worcester has long been known as the "Heart of the Commonwealth." Pop. (1910) est. at 144,470.

Word, the smallest detachable portion of a sentence—*i.e.*, the smallest sentence segment which, when abstracted, still suggests its possible sentence functions. The term has two senses: (1) *particular word*, the single concrete utterance in an actual sentence—*e.g.*, *book*, in *give me the book*; (2) *general word*, or the psychical word picture generalized out of, and serving as substrate to, all the concrete occurrences of identical or similar forms —*e.g.*, Eng. *book*, Fr. *livre*. Actual language consists always of sentences. The real particular word exists only as an organic part of an actual sentence, and the real general or psychical word only as implicitly capable of filling one or more places in any appropriate sentence type. In primitive language the sentence is an undivided whole, and words and sentences are identical ("incorporating" languages). Individual parts may have a clearly felt force, but the native mind does not recognize their sentence function when abstracted; *e.g.*, Massachusetts (Indian) *wut-appesituqussun-nooweht-unk-quoh*, literally, he-came-to-a-state-of-rest-on-bended-knees-doing-reverence-to-him; Accadian *in-bat*, he-opened, *in-nin-bat*, he-opened-it, *in-šub-šube*, he-built-a-building; Basque *didac*, I-have-it-for-you, *dizut*, you-have-it-for-me. Purely pronominal sentences often remain incorporating (*i.e.*, single words) even in highly developed inflectional and agglutinative languages, *e.g.*, Arabian *aqtala*, he caused to kill; Kongo *wamvondisa*, he caused him to kill. Word order in Japanese is the same as if the whole sentence were still one compound word.

Speakers of every language in time develop a limited number of *sentence types*. Every actual sentence must thereafter approximately embody one of these types, and consist of *sentence members* conforming to the general structure picture, *e.g.*, *the boy—runs*, *the rain—fell in torrents* are both sentences of the "simple declarative" type having as members a subject and predicate; *the man—who saw him—told me* is of the complex declarative type, etc. Sentence members are in turn capable of sub-organization into what we may call significant portions. One significant portion may indeed constitute a whole member, *e.g.* (*the-boy*)—*walks*, but more often thoughts and feelings and our linguistic expression of them are complex, *e.g.*, *the shepherd—strokes* + *the dog's* + *back* + *with-his-hand*, *the boy—went-away* + *without-getting* + *what-he-came-for*. Here *stroke-s*, *with-his-hand*, *what-he-came-for*, etc., are significant sentence portions within the larger sentence members. As the speaker comes to regard these portions as *separable* components of the sentence, and unconsciously reshapes his language accordingly, words begin to coincide normally with sentence portions (inflectional languages), *e.g.*, Greek, *ὄρνιθα πέτρᾳ βάλλει*, literally, the-bird with-a-stone he-hits; Latin, *dorsum cani manu remulcet pastor*, the-shepherd stroke-s the-dog's back with-his-hand; English, *John's ship ran aground* = the-ship of-John did-run on-the-ground. In this stage of language different particular words associate themselves as "*forms*" under one general word, *e.g.*, *I*, *me*, *we*, *us* are forms of *I*; *am*, *was*, etc., are forms of *be*, etc. *Usually* the different forms of a word come to closely resemble each other, and then their common portion comes to be felt as a "*stem*" whose variations are felt as "*inflections*."

Sentence portions having resembling significance (whether different words or forms of the same word) constantly tend to form association groups, and in the end (see ANALOGY) to acquire resembling forms, with constant variations for the expression of like variations in meaning, relation, or function. The constant part then becomes a "*root*" (*e.g.*, *sorr-* in *sorrow* and *sorry*, *str-ng* in *strong* and *strength*). When the variation in form is not completely fused with the root, it then becomes an *affix* (either *prefix*, *suffix*, or *infix*), *e.g.*, *-y* in *sorry*, etc. As fast as this analysis succeeds in expressing itself in the sentence structure, roots, or both roots and affixes, become detachable as words. Three stages of development arise: (1) Either the significant root (or stem) alone or the root and affix together constitute a word, but the affix alone does not (agglutinative languages), *e.g.*, Sanskrit, *sarva-* or *sarva-s*, all; in Kongo *tua-ki-vangidi*, literally, we it made, *vangidi* alone is a word, or *tua-ki-vangidi* is one word, but neither *tua* nor *ki* nor *tuaki* are words; English *home-ward*, etc. (2) Both significant root and relational root are words (analytic languages). (3) Significant, relational, and mechanical roots are all words (isolating or root languages).

Words felt as having a common root are called *cognates*. If the root is felt to be practically identical in form with one of a group of cognates, this is regarded as a *primate* (or *primitive*) to which the rest are *derivates* (or *derivatives*). Logically, derivation implies some change or addition to the concept expressed by a word.

Pailful, *church-steeple*, *pickpocket*, *foretell*, *forget-me-not*, etc., are examples of compound words. In English nearly all parts of speech are freely compoundable with each other, as in the examples above (noun + adj., noun + noun, verb + noun, adv. + verb, verb + pron. + adv.). Compounds may be (1) copulative, with both members on an equal footing, *e.g.*, *The* THOMPSON-HOUSTON *Co.*; (2) determinative, with one (in English the former) member serving as a modifier of the other, *e.g.*, *wind-mill*, *ill-gotten*; (3) secondary adjective, *e.g.*, *a* THREE-FOOT *rule*, UPHILL *work*, etc. As a rule, logical derivation and fusion of meaning subsists between the members of a compound, but this makes them one word only as it makes them fill the place of one word in sentence structure.

Wor'den, John Lorimer, 1818–87; rear admiral, U. S. navy; b. Westchester Co., N. Y.; entered the navy as midshipman, 1834; commanded the *Monitor* in her fight with the *Merrimac*, March 9, 1862, and the *Montauk* in the attacks on Fort McAllister, January 27 and February 1, 1863, and in the first Fort Sumter fight, April 7, 1863. He was promoted captain, 1863; commanded the *Pensacola* in the Pacific squadron, 1866–67; promoted to commodore, 1868; superintendent of Naval Academy, 1870–74; rear admiral, 1872; commander in chief European squadron, 1875; retired, 1886.

Words'worth, William, 1770–1850; English poet; b. Cockermouth, England. In 1787 he entered St. John's College, Cambridge. In his second vacation he and his friend Jones took the "unprecedented course" of taking a walking tour in Switzerland, afterwards described in "The Prelude." Wordsworth took his B. A. degree in 1791, and left Cambridge; later in 1791 he paid a visit to France. With limited resources, and still uncertain of his genius, Wordsworth lingered in England without a profession. At length, in 1794, he was relieved from the absolute necessity of working by a legacy from a young friend, Raisley Calvert. In 1795 his sister joined him, and they settled at Racedown, in Dorset. His earliest publications, "The Evening Walk" and "Descriptive Sketches," written in the old-fashioned style of the preceding century, had appeared in 1792; he was now determined to be a poet, but his style came to him slowly. Coleridge became his friend in 1797, and the Wordsworths removed to Alfoxden, to be near Coleridge at Nether Stoway. Here the greater part of the "Lyrical Ballads," published in 1798, was composed. On the appearance of this volume the Wordsworths left for Germany, and spent the winter at Goslar. Here Wordsworth wrote some of the finest and most characteristic of his poems, and here "The Prelude" was planned and begun. Returning to England in 1799, the poet and his sister settled in a cottage at Townend, Grasmere, "the lovely cottage in the guardian nook." From this time forward the life of Wordsworth, although to be prolonged for more than half a century, was to be almost without external incident. In 1800 he issued a new edition of the "Lyrical Ballads," with a second volume of unpublished and maturer poems.

His tours now take importance in his career because they stimulated him to direct poetic production. In 1802 the Wordsworths went to France, in 1803 to Scotland. In 1808 Wordsworth moved to Allan Bank, and then, in 1811, to the parsonage of Grasmere, where he lived for two years. In the spring of 1813 Lord Lonsdale appointed the poet distributor of stamps for Westmoreland, and Wordsworth moved into the more commodious residence of Rydal Mount, near Ambleside. A more lucrative local post he afterwards declined. The remainder of his life was spent at Rydal. In 1814 Wordsworth published the long and elaborate poem of "The Excursion," in which his poetical philosophy was for the first time put strenuously before the public. This didactic epic was received at first with scant respect, and even with open ridicule, but it soon became accepted as one of the masterpieces of English poetry.

In 1815 appeared a collection of Wordsworth's lyrical poems, arranged upon a new plan, and in two essays, prefixed and appended to this volume, he developed his theory of poetic art. A second tour had been taken in Scotland in 1814, and had, as usual, stimulated the poet to write. But his finest gift, that of solemn and penetrative melody, was now about to leave him forever, and after 1820, if not after 1816, he can scarcely be held to have added to what is exquisite in English literature, although he continued to be earnest, forcible, and sometimes stately in his verse. In 1815 he published the romantic narrative of "The White Doe of Rylestone"; in 1819 "Peter Bell" and "The Waggoner," two juvenile studies in somewhat affected excess of simplicity; in 1820 the series of sonnets entitled "The River Duddon"; in 1822 a first draft of those "Ecclesiastical Sonnets" which long entertained his middle life; in 1835 a rather barren volume named "Yarrow Revisited." The serenity of his life was troubled in 1832 by his sister's mental decay, and in 1834 by the death of Coleridge. But he was now enjoying a tardy celebrity; the Univ. of Oxford conferred upon him in 1839 the degree of D.C.L., in 1842 he received a pension of £300 a year from the civil list, and in 1843 succeeded Southey as poet laureate. His only remaining work of importance was the "Two Letters," on the railway projected between Kendal and Windermere, against which scheme he protested in 1844. His great poem, "The Prelude," was published in 1850, and "The Recluse" not till 1888.

Work'house, a house in which paupers are maintained at the public expense, those who are able bodied being compelled to work. See PAUPERISM.

Work Writ'er. See ERGOGRAPH.

World. See ASTRONOMY; CLIMATE; EARTH; GEOLOGY.

World's Colum'bian Exposi'tion. See EXPOSITIONS.

Worms (vōrms), town of Hesse-Darmstadt, on the Rhine; 20 m. NW. of Heidelberg. It is one of the oldest cities of Germany. It existed before the time of the Romans, was the residence of Charlemagne, and the seat of the diet before which Luther was summoned, 1521. In 1689 it was taken and sacked by the French, and only the cathedral, a fine structure, built 996–1016, of red sandstone in Byzantine style, and a few houses escaped destruction. It was soon rebuilt, but it never recovered its former prosperity. It manufactures leather, tobacco, and soap, and in its vicinity is produced the celebrated Rhenish wine called Liebfrauenmilch. Pop. (1905) 43,841.

Worms, or **Ver'mes,** a division of the animal kingdom which, together with ARTHROPODA, forms the branch called by the old zoölogists ARTICULATA. It includes a varied assortment of forms without many features in common. As a rule, they have long, cylindrical, or flattened bodies, and are without limbs or fins. A body cavity is usually present, and the nervous system, variously developed, always has a principal center (brain) above the throat. Excretory organs (nephridia) are usually present, and serve to carry waste products from the cœlom or from the tissues generally to the exterior.

Worms, Concor'dat of, in 1122, an agreement between the emperor and the pope, closing the long strife known as the War of Investitures. Neither obtained by it all that he had been striving for. The emperor renounced his right to confer the ring and crozier as symbols of ecclesiastical office, but retained the right of granting church and other property by the symbol of temporal authority. He also retained the right to be present in person or by proxy at ecclesiastical elections, provided that he abstained from bribery or compulsion. Though a compromise, it was in effect a victory for the Church.

Worm'wood, the leaves and flower tops of the *Artemisia absinthium*, a perennial plant of Europe, naturalized in the U. S. It possesses a strong, peculiar odor and a bitter, unpleasant taste, which are imparted to its infusions. The dried plant furnishes by distillation a dark-greenish oil. The bitter principle of wormwood (*absinthin*) forms a yellow, powdery mass. It is occasionally employed externally in medicine as an antiseptic, and formerly also as a tonic. The volatile oil of wormwood, upon which its active qualities depend, possesses narcotic properties, and if given in large doses produces convulsions, and even death; when mixed with oil of anise, fennel, etc., and dissolved in alcohol, it forms the liqueur absinthe (*q.v.*).

Wor'ship, the chief act of religion, and its natural expression. It is performed in various ways, from fetishism, the lowest form of human worship, to the highest adoration of Him who is the Supreme Spirit. The objects of worship are God, angels, spirits of ancestors, saints, powers and objects of nature, such as the sun, moon, and stars, relics, pictures, idols, etc. Of the natural objects, the sun enjoyed the greatest favor. The worship of Apollo, so popular among the Greeks, was really sun worship. Among the Phœnicians the sun was worshiped; so with the Sabeans, and the Incas in Peru, and with many other tribes more or less advanced in civilization. The Schoolmen emphasized the distinction between *latria* (service), rendered only to God, and *idolatria*, rendered to images.

Every pagan worship centers in sacrifices. They are offered to propitiate the divine favor and under a sense of guilt, or in thanksgiving, or to secure mercy and favor, or sometimes to serve as food or drink for the gods. Human sacrifices are offered under the notion that the most precious gift will buy the largest favor. As fire is deemed purifying, mysterious, and sacred, the highest sacrifice is by burning. Similarly, in the Old Testament, sacrifice appears at first as an expression of faith in a present God, as an act of propitiation and thanksgiving, and a pledge of a covenant. Sacred times were Sabbaths, new moons, the feasts of the Passover, Pentecost, Atonement, Tabernacles, Trumpets, Jubilee, Dedication, and Purim. In the completed temple service, to sacrifice were added prayer, praise, instrumental and vocal music, instruction, purification; also circumcision, vows, tithes, etc. The synagogue service, in which prayer took the place of the sacrifices of the temple, consisted of (1) prayers with written forms; (2) reading of Scripture in three parts—(a) Shema (three extracts from Numbers and Deuteronomy); (b) the Law; (c) Prophets; (3) expounding the Scriptures. Services were held Saturday, Monday, and Thursday, morning, noon, and evening, and were conducted by the "elders," ministers or "angels," and deacons.

The early Christians organized their services on the synagogue model. They met in private houses, or solitary places, or hired halls at any convenient and safe time. No stress was laid at first on a particular order. They read from the Old Testament, explaining the passage in free discourse, in which at first all could join. They listened to the exhortation of some eye witness of the Gospel history or to some letter written by an apostle. Individual gifts were used under the promptings of the Spirit, according to mutual regard and utility. Singing and prayer followed. Then the love feast and the covenant supper were solemnized, the kiss of fraternal love was given, and the voluntary offerings were made. By the end of the second century the service was divided into the *missa catechumenorum*, called "Scripture reading," in which were psalmody, Scripture lessons, the sermon, and some of the prayers, and the *missa fidelium*, called "prayers." In the latter the prayers which were all offered at the altar, were for consecration, for the whole Church, for the peace of the world, and all orders of men. There were also the eucharist, hymns, thanksgivings, and doxologies. By the third century Christian temples were frequent, and sometimes splendid. They were divided into the porch, nave—where the pulpit stood—and the sacristy. In the fourth century triumphant Christianity built magnificent churches or appropriated public buildings, and adorned its clergy with peculiar costumes, kindled lights on the altars, used incense, and gave more attention to artistic music and responses. The *agape* was separated from the Lord's Supper and became a feast. With the union of Church and State the liturgical tendencies were rapidly developed, forms were multiplied, and the ministers came to be held as a peculiar class. See CLERGY.

The public worship of the Church includes: (1) Prayer written and formal or unstudied, standing or kneeling, rarely prostrate, with uncovered heads, with or without responses. (2) Reading of Scripture. (3) Preaching, exposition, exhortation, etc. (4) Singing by the congregation or, later, by choirs. (5) Confession of faith. (6) Voluntary offerings; and (7) sacraments, which universally are two in number —baptism and the Lord's Supper. The latter was celebrated every day, or every Lord's Day, or at longer intervals. Christian worship is held on the Lord's Day, or on daily or on yearly festivals or fasts which commemorate special events.

Worsted (wost'ĕd). See WOOL AND WOOLEN MANUFACTURES.

Worth, William Jenkins, 1794–1849; American soldier; b. at Hudson, N. Y.; fought in the War of 1812; became captain in 1815. Appointed colonel of the Eighth Infantry, 1838, he commanded the N. department during the insurrectionary movement on the Canada border, 1838–39; ordered to Florida, 1840, and placed in command of the army there. In Florida breveted brigadier general for gallantry and highly distinguished services, 1842, and retained in Florida until the outbreak of the war with Mexico, 1846. For his services at Monterey, Congress presented him with a sword of honor. A handsome memorial monument was erected by the city of New York at the junction of Broadway and Fifth Avenue, beneath which rest his remains.

Wörth (vört), village of Alsace, at the junction of the Sulzbach and the Sauerbach. It is noted as the point where the first decisive encounter took place between the French and German armies, August 6, 1870. The principal point in the French position was Fröschweiler, a village on the road between Wörth and Reichshofen. See Franco-German War.

Wounds, injuries classified according to their nature as (1) punctured wounds, made with pointed instruments; (2) incised wounds, produced by cutting instruments or sharp edges; (3) lacerated wounds, in which the borders of the wound are irregular, ragged, and torn, and the result of great force, injuries by dull instruments, or tearing; (4) contused wounds, which are accompanied by much bruising; (5) poisoned wounds, in which either an animal venom or virus, or some impure, poisonous, or irritating matter has gained entrance to the injured tissues and contaminated the blood; and (6) gunshot wounds, which as a rule are penetrating, and may be lacerated, but differ from other wounds, owing to the character of the missile, the shock they give to the part and to the nervous system, and the grave complications to which they are liable.

Punctured wounds are relatively the most serious class, for they are often poisoned by the entrance, if not of venom or bacteria, of foreign matter, as rust, dust, splinters, clothing, etc., which cause suppuration at the bottom of the deep puncture, and lead to grave inflammation, erysipelas, and blood poisoning. The punctured wound is to be well washed with a solution of bichloride of mercury, or of boric acid or other antiseptic, cleansed of all blood clots and dirt, and if deep, or in the vicinity of dense fibrous tissue, as in the hand or foot, or near joints, must sometimes be freely cut and converted into an incised wound. The wound should be covered with dry gauze and bandaged. Incised wounds heal in several ways. They heal most promptly and simply when perfectly smooth, clean cut, free from clotted blood, and in the flesh of persons in perfect health. Thus a clean cut whose borders do not gape or separate may, if instantly closed and sealed from the air by plaster or collodion, heal in a few hours, and approximately warrant the designation immediate union, or union by first intention. More often a day or two is required; the wound, being cleansed of clots or foreign matter, is exposed for a moment to the air, and closed either by adhesive plaster or stitches of silk, catgut, silkworm gut, or silver wire. The opposed surfaces are glazed over by a film of lymph, containing white blood corpuscles, and this, filling the interspace, agglutinates the walls of the wound and organizes a firm scar of fibrous tissue. Such speedy healing is termed union by adhesion, or primary union. When a wound has been lacerated, or a considerable area of tissue has been removed, the deficit has to be made up by a slower process of new tissue growth; new cells develop one by one, in layers, until the level of the surface is reached, when the skin begins to heal and shoot over the ray area. This is healing by granulation, or by second intention, slower than the others, and, if the wound be large, a severe tax upon the strength of the patient. In lacerated wounds the more ragged points, if left, will be destroyed by sloughing before the wound can begin to heal, and the delay often converts the wound into an indolent ulcer; therefore it is better to remove the irregularities and convert the injuries into incised wounds, either straight or irregular, which can be brought together and heal. When an incised wound has failed of union by adhesion, its walls become covered with granulations, when they may sometimes become approximated and soon unite, constituting the process of union by secondary adhesion or by third intention.

In granulation the growth of tissue may become exuberant and rise above the surrounding healing parts, or even the healthy intact surface. Such excess of granulation is termed proud flesh. It must be reduced by astringents or compression, or destroyed by caustics, and the site stimulated to healthier action. Poisoned wounds should be laid freely open by incision, treated by disinfectant lotions, and the general strength of the patient sustained by diet, tonics, and stimulants. Contusions are usually best treated by soothing lotions, as lead water and laudanum, which may be applied cold or warm, as most agreeable to the patient. The healing of a wound is facilitated by pure air, regular hours for sleep, plain but nutritious diet, and abstinence from alcohol. For the treatment of bleeding, see Bleeding or Hemorrhage.

Wrang'ler, so called from the public disputations in which candidates for degrees were formerly required to take part, one of the first class of honor men of the mathematical tripos in the Univ. of Cambridge, England. The number of these is not limited. The first of them is called the senior wrangler. See Tripos.

Wreck, at common law, vessels or parts of vessels or goods cast by the sea upon the land, within the limits of a county and there left. At early common law wreck belonged to the king, without regard to the claims of the owner; and the statutes of Henry I, of Henry II, and Edward I modified this rule by permitting the owner to recover his property, provided a person or animal escaped from the wreck alive. Such was not the view of Lord Coke, who agrees with Bracton that the king shall have wreck as he shall have great fish, because none claims the property; that wreck is estray on the sea coming to land, as estray of beasts is on the land coming within any privileged place; and the law gives in both cases a year and a day to claim them. In Great Britain the general superintendence of all matters relating to wreck is now confided to the Board of Trade. In the U. S. common-law wrecks are matters of state jurisdiction generally, although the licensing of vessels to engage in wrecking, the disposition of property wrecked on certain coasts, and the control of the life-saving service are subjects for Federal legislation.

The term is also applied, in the law of marine insurance, to a ship so injured at sea as to become unnavigable, or unable to pursue her voyage without repairs exceeding the half of her value. See FLOTSAM; JETSAM.

Wren, Sir Christopher, 1632–1723; English architect; b. East Knoyle, England. He made many inventions, including the wheel barometer and mezzotint engraving, wrote much on scientific and other subjects, and was a founder of the Royal Society. In 1657 he was Prof. of Astronomy in Gresham College, London, and in 1660 at Oxford; Surveyor General, 1667–1717. In 1663 he designed the chapel of Pembroke College, Cambridge, and prepared his plans for the restoration of St. Paul's Cathedral, which gave rise to protracted discussions, in the midst of which occurred the great fire of London, 1666. Later he erected many public buildings and churches, including the new St. Paul's. The first stone was laid 1675 and the last thirty-five years later. His other works include the hospitals at Greenwich and Chelsea and the W. front and towers of Westminster Abbey. Between 1685 and 1713 sat in Parliament. He was buried in the crypt of St. Paul's.

Wren, any member of a group of song birds which vary in appearance and habits, but the plumage is generally more or less brown with fine dark bars, and the birds pass much of their time on or near the ground, some being partial to marshes, where they build large round nests among the rushes. Others nest in bushes, hollow stumps, or holes in branches. The eggs are six or eight in number, usually white with fine reddish spots, and two or three broods are raised in a season. None is found in Africa, and only fifteen species in Europe and Asia, while nearly 150 species occur in America, their headquarters being in the tropics. Fourteen species dwell in the limits of the U. S. The common European species is, next to the kinglet, the smallest bird in Europe; its nearest relative in the U. S. is the winter wren, a little bird found over the greater portion of N. America. It is shy, with short wings and a shorter tail; dark brown above, whitish below, barred with blackish. The house wren is another common species, often nesting in boxes. The cactus wren of the SW. is a large species, 8 in. long, and a representative of numerous Central and S. American forms. The wren is beneficial about gardens, as it is a foe to insects. See BIRDS' NESTS.

Wres'tling, an athletic sport in which each of the two contestants endeavors to throw his opponent to the ground. It is one of the oldest as well as the most universal of exercises. It flourished most among the ancients, and was a prominent feature of the Olympian games. Among the Greeks, the competitors trained for months prior to the competition, and the victor was fêted, processions formed in his honor, special privileges were conferred upon him, and in some of the cities his statue was placed in one of the temples. Most famous among the ancient wrestlers was Milo of Croton, six times the winner at the Olympian and Isthmian games. Homer's account of the match between Ajax and Ulysses is probably the most perfect account that remains to us of these ancient competitions. Pausanias states that Theseus made the first wrestling rules. During the Homeric age the wrestlers were naked, with the exception of the loin cloth. This custom continued until the fifteenth Olympiad. In the time of Solon oiling and dusting were practiced, and there seems to have been some special significance attached to the dusting process, since we read that dust brought from certain localities was much more highly prized by the wrestlers than that from others. In Argos flute music for a time accompanied the wrestling. There were two distinct types of wrestling among the ancients: one where the competitors stood and struggled for a fall, and the other, in which the competition might still go on after the competitor was upon the ground, until a specified part of the body was on the ground. Falling on the face did not constitute a fall. If a man was thrown three times from the standing position, he was beaten. The old Greek rules forbade striking and kicking, but allowed breaking of fingers, throttling, etc. Wrestling competitions were popular in the olden times in the British Isles, and contests were held annually in London on St. James's Day, at which time we find a ram or a cock was offered for the prize.

In later times some distinct kinds of wrestling have been developed, in both Great Britain and the U. S. One of the best known of the English styles is that practiced in Cumberland and Westmoreland. Here the competitors usually dressed in close-fitting costumes. The rules compelled them to stand chest to chest, each placing his chin on his opponent's right shoulder and grasping him around the body, each placing his left hand above the right of his antagonist. If either party breaks his hold, though not on the ground, the one so letting go is the loser. If either touch the ground with any part of the body except the feet, he shall be deemed the loser.

Another famous style is that of the Cornish and Devonshire men. The greatest rivalry exists between Cornwall and Devon. Here kicking was formerly allowed, and heavy-soled shoes, sometimes with thin steel plating inserted within the leather, were worn, so that injuries resulting from the game were serious. The judging is difficult, and the quarreling resulting therefrom has brought the style into disfavor. It is required that both hips and one shoulder, or both shoulders and one hip (or sometimes both shoulders and both hips) reach the ground simultaneously, and this before any other portion (as the arm or knee) of either thrower or thrown reaches it.

The Lancashire style is the roughest of all the English wrestling. It allows catching by the legs, wrestling on the ground, and other objectionable features. The wrestlers combat in stockinged feet, and are not allowed to scratch, strike, or maim. A fall is constituted by both shoulders touching the ground. The Scotch style is largely modeled after that of the Lancashire.

In the French style the wrestlers are allowed to take hold from the head to the waist. Tripping is prohibited. Competitors are not allowed to strike, scratch, or to clasp hands, although they may grasp their own wrists or other portions of their own bodies. They may not wrestle barefooted, but in the stocking. If one of the wrestlers falls on his knee, shoulder, or side, he must begin again. The one whose shoulders first touch the ground is the loser, providing both shoulders are on the ground at the same time.

The German style is a struggle on the ground. The wrestlers can catch hold of the legs, or indeed anywhere below the waist. This wrestling starts with the men standing erect, but is usually finished by a competition on the ground, an effort being made to turn the fallen man so that his shoulders may rest upon the ground.

The Greco-Roman is not much favored. Like some of the previous styles, it allows only of the clasping of the body above the waist, and does not permit of wrestling upon the ground. The much more popular style is the catch-as-catch-can. Here all brutal playing is barred by the rules, and yet there is always more or less savage work. The competitor may twist a head or a foot to the extremes of safety, but it is always within the power of the sufferer to relieve himself from the punishment by admitting a fall. In this, as in the Greco-Roman style, a fall is lost when both shoulders touch the ground.

Wright, Silas, 1795–1847; American lawyer; b. at Amherst, Mass.; graduated at Middlebury College, Vermont, 1815; studied law; admitted to the bar, 1819; elected to the state senate as a Democrat, 1823; was a member of Congress, 1827–29; Comptroller of New York, 1829–33; U. S. Senator, 1833–44; supported Clay's Compromise Bill and defended the removal of the deposits from the U. S. Bank by Pres. Jackson, 1833; opposed the recharter of the U. S. Bank and the distribution of the surplus Federal revenues among the states; chosen Governor of New York in 1844; repeatedly declined appointments to foreign missions, and an offer of a seat in the Cabinet or on the Supreme Bench by Pres. Tyler, and of the Secretaryship of the Treasury by Pres. Polk, 1845; was defeated as a candidate for reëlection, 1846, and retired to his farm at Canton.

Writ, in law, a formal instrument, issued by or under authority of a court, commanding the person to whom it is addressed to do a certain act therein specified. It is written in the form of a mandate from the highest authority in the state—the king in Great Britain, the President, people, or commonwealth in the U. S.—attested by the chief judge of the court, sealed and signed by the clerk, and may be issued either at the commencement of an action or proceeding, or during its progress, to the sheriff or to some other person, for the purpose of procuring various acts to be done in connection with such action or proceeding. Among the most familiar were the writs of "error" and of "*certiorari*" for the review of judgments and other judicial decisions.

Writ'ing, the art of expressing ideas by visible signs or characters inscribed on some material. It is either ideographic or phonetic. Ideographic writing may be either pictorial, representing objects by imitating their forms, or symbolic, by indicating their nature or proportions. Phonetic writing may be syllabic or alphabetic; in the former each character represents a syllable, in the latter a single letter. The various ancient systems of writing had probably at least three different sources, the Egyptian, the Assyrian, and the Chinese systems, all of which were originally hieroglyphic. The Egyptians practiced four distinct styles of writing, the hieroglyphic, hieratic, demotic or enchorial, and Coptic. There are three classes of cuneiform characters, the Assyrian or Babylonian, the Scythian or Median, and the Persian. Of these three original systems, the Egyptian is by far the most important, for from its hieratic symbols was probably derived the Phœnician alphabet, the parent of almost all the principal graphic systems of the world. The Phœnicians adopted only the phonetic symbols, and thus originated the first purely alphabetic system of writing. There are five main branches of the Phœnician alphabet: (1) the Semitic; (2) the central, or Greek; (3) the Western, comprising the systems of writing which grew out of the spread of the Phœnician alphabet in Spain; (4) the Northern, or Runic; (5) the Indo-Homerite (Himyarite). Of the central branch, the Italian subdivision is the parent of the Lombardic, Visigothic, Anglo-Saxon, Gallic, Merovingian, and German graphic styles, all of which were in use before Charlemagne, and of those which followed him, including the Caroline, the Capetian, and the modern Gothic, of which the present German alphabet is a modification.

The Roman letters were used in Italy until the latter part of the sixth century, when the Lombardic style was introduced. There are no traces of writing in Britain before the Roman conquest, when Latin letters were introduced. The Roman-Saxon prevailed until the middle of the eighth century; the set Saxon succeeded it, lasting until the middle of the ninth; this was followed by the running-hand Saxon of the time of Alfred; the mixed Saxon, combining the Roman, Lombardic, and Saxon letters; and the elegant Saxon, which was introduced in the tenth century, and did not become obsolete until the middle of the twelfth. The Norman style came in with William the Conqueror. The modern Gothic dates in England from the twelfth century; the old English from the middle of the fourteenth; the set chancery and common chancery from the latter part of the same century. The English court hand was contrived by the lawyers in the sixteenth century, and lasted till the reign of George II, when it was abolished by law. The Russian alphabet is a modified form of the Cyrillic. Peter the Great reduced it to thirty-six characters. In general the Semitic races wrote from right to left, and the Aryan from left to right. The cuneiform inscriptions are always from left to right. The Chinese and Japanese write in columns, beginning at the top and passing from right to left. The Mexican picture writing was also in columns, but read from the bottom upward.

The first who gave especial attention to the reduction of foreign graphic systems to a uniform orthography in Roman characters was Sir William Jones; but no generally satisfactory system was devised till 1853, when Prof. Lepsius, of the Univ. of Berlin, published his "Standard Alphabet." In this are recognized only three primary vowels, *a*, *i*, and *u*, pronounced as in German and Italian. Between these are ranged the various other vowel sounds of different languages, expanded to thirty in all. Of the consonants, forty-eight different sounds are recognized. To represent these seventy-eight vocalic and consonantal sounds, Roman letters distinguished by various diacritical marks are used in all but nine cases, in two of which the Arabic and Greek rough breathings are represented by their signs, and in the remaining seven, Greek characters are employed. With respect to writing materials—the stylus for wax tablets, palm leaves, and lead, the reed pen for papyrus, parchment, leather, and cotton paper, the brush for illumination and for writing like the Chinese—such particulars belong rather to the making of books. But it is proved that the Syrians sometimes, if not often, used the quill. See ALPHABET; INSCRIPTIONS.

Writing Machines'. See TYPEWRITERS; TELAUTOGRAPH.

Writ of Assist'ance. See ASSISTANCE, WRIT OF.

Wry'neck, named from its habit of twisting the neck in a serpentine manner, a genus of birds closely related to the woodpeckers, from which they differ principally in the soft tail feathers and mottled buff, brown, and gray plumage. The group is confined to Europe, Asia, and Africa, the best-known species being *Iynx torquilla*, a form common to all three countries, though occurring in Europe only as a migrant. It is easily tamed. It lives mostly on ants and caterpillars.

Würtemberg, or **Württemberg** (vürt'tĕm-bĕrkh), kingdom in the SW. of the German Empire; third in area and in population; area, 7,529 sq. m. It is bounded on the N., W., and S. by Bavaria and Baden, on the E. by Bavaria, and is separated from Switzerland by Lake Constance on its S. frontier. The larger part of it belongs to the western S. German table-land, traversed by the Schwarzwald (Black Forest) and the Suabian Jura, or the Rauhe Alp; the rest is rather hilly than mountainous. The average elevation is 1,640 ft.; the lowest point is 437 ft. above sea level. The Danube traverses the S. part of the country for 65 m., and receives the Iller above Ulm. The Neckar, which rises in the SE. of the country, where the Schwarzwald and the Rauhe Alp meet, flows N. to the Rhine for 186 m. The Tauber, a tributary of the Main, flows through the N. part of the country. All these are navigable. Of the artificial waterways, the Wilhelms Canal is the most important, making the Neckar navigable from Cannstadt to Heilbronn. Lakes are numerous. The climate in the Black Forest is severe but healthful; in the other parts of the country moderate and invigorating. The soil is, on the whole, good and well cultivated; in middle and lower Suabia are the most fertile districts.

Agriculture is flourishing. Of cereals, spelt, oats, maize, rape, rye, wheat, hemp, and flax are raised in abundance, together with leguminous plants and tobacco (13,360 cwt. annually), hops, chicory, etc. The garden, fruit, and vine cultivation is famous. Cattle breeding is extensively carried on. Several government stud farms improve the race of horses. Mining, which is chiefly in the hands of the state, is almost confined to iron and salt, the latter in five great government salt works. Industry, owing to the copious water power, is important. Noteworthy are the flax-spinning and weaving works; the wool, cotton, linen, and lace manufactures; the silk industry, which is the most considerable in Germany; the paper mills, the manufactures of iron and other metal ware; the tileworks and manufactures of earthenware, glass, and chemicals; the dyeworks, the tanneries, the sugar refineries; the manufactures of tobacco, woodenware, etc. Since Würtemberg joined the German Zollverein, in 1834, commerce has steadily increased; it exports especially cattle, grain, wool, timber, salt, fruits, hops, cloth and woolens, linen, leather and paper, Black Forest clocks, gold and silverware, and chemical products. The imports are less considerable, and consist mostly of coal, cotton, porcelain, faïence, and drugs. Würtemberg's book trade ranks next to that of Berlin and Leipzig. The most important commercial places are Heilbronn, Cannstadt, Ulm, Friedrichshafen, Stuttgart, Reutlingen, and Tuttlingen. Education is compulsory, and there is an elementary school for every group of thirty families. The Univ. of Tübingen enjoys a world-wide fame; there are also a polytechnic institute, an art school, an architectural school, a music conservatory, a veterinary school at Stuttgart, an agricultural academy at Hohenheim, a military school at Ludwigsburg, real schools of various grades, Latin schools, gymnasia, and lycea, besides Roman Catholic and evangelical seminaries and numerous industrial schools, as well as many charitable institutions.

There were, in 1905, 2,302,179 inhabitants. Six towns have each a population exceeding 20,000. According to creed, 69.3 per cent are Protestants, 29.8 per cent Roman Catholics, 0.36 per cent other Christians, 0.57 per cent Jews.

The government is a constitutional monarchy with four votes in the federal council and seventeen in the imperial diet. The crown is hereditary, and the female line is not excluded. The constitution dates from September 25, 1819, amended in 1868 and 1874. The representation consists of two chambers. The first chamber, the peers (*Standesherren*), has forty-five members, of whom thirty-six are members by birthright, and nine are chosen for life by the king. The second chamber (*Abgeordnetenhaus*) has ninety-three members, chosen for six years—thirteen by the nobility, six by the Protestant and three by the Roman Catholic clergy, one by the university, seven by the cities, and sixty-three by the rural communities. The troops form under the terms of the Convention of 1870 the Thirteenth German Army Corps, consisting of 24,120 men, 4,190 horses, and sixty-four cannons in peace (1896–97); 69,934 men and 120 cannons on the war footing. For administrative purposes the country is divided into four circles (*Kreise*)—the Neckar, Schwarzwald, Danube, and Jagst.

In ancient times Würtemberg was occupied by the Suevi, a Germanic race. Abt. 84 A.D. it came under Roman authority, and out of the Roman colonies grew up the cities. About the beginning of the third century the Allemanni drove the Romans beyond the Danube and the Rhine, but they in turn were conquered by the Franks under Clovis in the battle of Tolbiacum (Zülpich) in 496. Abt. 900, under the German emperors of the Carlovingian dynasty, the duchy of Suabia was formed. The family of the Counts of Würtemberg first appeared in the eleventh century, and grew rapidly in power. Eberhard V, surnamed "im Bart" (1457–96), one of the most energetic and illustrious Counts of Würtemberg, was made a duke by Emperor Maximilian I in 1495. Though Würtemberg tried to remain neutral during the earlier part of the Thirty Years' War, it suffered severely from the opposed armies; in 1633 it entered into an alliance with Sweden against Austria, and was devastated by the imperial troops; of 400,000 people, only 50,000 were left after that disastrous war. A similar fate befell it when Louis XIV began an unprovoked war, and sent Melac to ravage along the Rhine. The destructive invasion of the French (1688–92), followed by the disastrous reign of Duke Eberhard Ludwig and his mistresses (1693–1733), nearly ruined the country, which invoked the intervention of Prussia and England in vain.

In 1796 it became involved in a war with France, and was compelled to cede Mömpelgard (Montbéliard), but in 1803, Duke Frederick II obtained as a compensation the electoral dignity and extensive territories, which were formed into a particular division of the state, and called Neu-Würtemberg; 1805, an alliance was concluded with Napoleon I, and, 1806, the elector was made a king by Napoleon, and his territory greatly enlarged. The kingdom became a member of the Rhenish Confederacy, and, in 1809, Ulm, Mergentheim, and other cities were added to it, but it had to furnish an army of 16,000 men for the ill-fated campaign to Russia (1812). By the Treaty of Fulda (1813), Würtemberg broke its alliance with France and joined the other German princes against Napoleon, having all its possessions guaranteed by the allies. King William (1816–64) granted the constitution of 1819. In 1866, Würtemberg sided with Austria against Prussia, and had to pay a war indemnity of 8,000,000 florins, and formed an offensive and defensive alliance with Prussia, agreeing to reorganize its army after the Prussian model; 1870, it joined the other German states in the formation of the German Empire, and had its share in the victory over France.

Würzburg (vėrts'bŏrkh), town of Bavaria; 60 m. SE. of Frankfort; on the Main; formerly the capital of the bishopric of Würzburg, which (until 1803, when it was secularized and its territory conferred on the Elector of Bavaria) formed an independent and wealthy ecclesiastical principality of Germany. The episcopal palace, built in 1720, is one of the most magnificent royal residences of Europe. The cathedral, built in the eleventh century, is an elegant edifice. The university, with which are connected a magnificent hospital and a library of 200,000 volumes, enjoys a great reputation, especially for its medical department. Besides its university the city has other educational institutions, and manufactures of leather, tobacco, cloth, woolen fabrics, and surgical and mathematical instruments. The vicinity produces very fine wine. Pop. (1905) 80,327.

Wu Ting Fang, 1842– ; Chinese statesman and diplomatist. In 1874 he went to England to study law, and became a barrister. As secretary of the Peace Commission which made the treaty at the close of the war with Japan, he won such distinction that he was appointed minister to the U. S. in 1896. During the siege of Peking, in 1900, Minister Wu succeeded in sending a dispatch in cipher to Minister Conger, of the U. S. Legation, and received a reply. This assured the powers that the legations were alive, and averted a war of devastation. Minister Wu was recalled in the fall of 1902, and was placed at the head of the department of foreign affairs in the Chinese Govt. Reappointed minister to the U. S., 1908.

Wy'att, Sir Thomas, 1503–42; English poet; b. at Allington Castle, Kent; son of Sir Henry (d. 1538), a prominent friend of Henry VII; educated at Oxford and at St. John's College, Cambridge; took his degree, 1518; made the tour of Europe; married Eleanor, daughter of Lord Cobham; became a gentleman of the king's bedchamber; gained a high reputation at court by his poems, his skill at arms, in music, and in repartee, and his knowledge of continental languages; and was sent by Henry VIII on several diplomatic missions. He left a considerable number of poems, largely love sonnets in the Italian manner.

Wycherly, or Wycherley (wĭch'ėr-lĭ), **William,** abt. 1640–1715; English dramatist; b. Clive, England. In 1672 he produced his first play, "Love in a Wood," composed, according to his own account, when he was but nineteen;

was a court favorite. His other plays are "The Gentleman Dancing Master," "The Country Wife," and "The Plain Dealer," all too licentious for modern representation. In 1704 he published "Miscellany Poems," which were corrected by Pope, but remarkable chiefly for bad rhymes and worse morality.

Wyclif, Wickliffe, or **Wiclif** (wĭk'lĭf), **John,** sometimes DE WYCLIF, abt. 1324–84; English reformer; b. Ipreswel (now Hipswell), near Richmond, Yorkshire; was a scholar of Baliol College, Oxford; then a fellow, and between 1356 and 1361 master of the college. He is supposed to have published in 1356 his first work, "The Last Age of the Church," in which he argued that the millennium was past, that the world was then under the reign of Satan and of Antichrist, and that the day of judgment was near at hand; was led to identify the papacy with Antichrist; abt. 1360, vigorously attacked the mendicant orders. In 1361 he accepted the college living of Fillingham, but exchanged it for the poorer living of Ludgershall, 1369. In 1370 he took his degree of D.D., but he had begun to read lectures on divinity at Oxford abt. 1363. He was chaplain to Edward III, and wrote against the papal demand for arrears of tribute from the English crown, 1365. In 1374 he was appointed to the living of Lutterworth, and was one of six commissioners sent by Edward III to Bruges to confer with the papal delegates; remained abroad two years.

In 1376 his vigorous attacks on the papal pretensions caused excitement in England, and he was accused of heresy by Archbishop Courtney, and summoned before a convocation of the clergy at St. Paul's, London; was attended thither (February 19, 1377) by the two most powerful subjects of the kingdom, John of Gaunt and Henry Percy, the earl marshal, whose defense of Wyclif gave rise to a popular tumult in which the Savoy Palace, the residence of the former prince, was attacked; was directly accused of heresy in five bulls issued by Pope Gregory VI, 1377, by which he was cited before a synod at Lambeth in 1378; was saved from active persecution by the intervention of the Princess of Wales, and especially by the breaking out of the great papal schism; was allowed to depart with an admonition. He was not fighting these battles alone, but was supported by the chancellor and many of the officers at Oxford Univ., and by a great part of the nation; and in order to deepen the impression of the movement he began to send out many disciples, who under the name of poor priests preached his doctrines.

Wych'elm, Witch-elm, or **Scotch Elm,** the *Ulmus montana*, a large, fast-growing European elm, much planted for ornament and affording good timber. It is very hardy in the U. S.

Wyo'ming, one of the U. S. of N. America; sometimes called the EQUALITY STATE; the thirty-first state admitted to the Union; capital, Cheyenne. It is bounded N. by Montana, E. by S. Dakota and Nebraska, S. by Colorado and Utah, W. by Utah, Idaho, and Montana; length from E. to W., 355 m.; width from N. to S., 276 m.; area, 97,890 sq. m., of which 315 are water surface; pop. (1910) est. at 130,000.

The general appearance of the state is mountainous, with valleys, foothills, and rolling plains. The mean elevation is 6,000 ft. The main range of the Rocky Mountains enters on the S., and extends NW. through the state into Montana and Idaho. Wind River Mountains, with altitude of from 10,000 to 12,000 ft., are the culminating crest of the Rocky Mountains in the NW., and are paralleled on the W. by the Teton and Gros Ventre ranges. The Shoshone Mountains, 10,000 to 11,000 ft., lie N. of the Wind River Range, and the Big Horn Mountains extend from the middle of the N. boundary S. to the center of the state. The Rattle Snake Mountains, with the Casper and Seminoe ranges, are S. of the Big Horn Range, while the Black Hills occupy part of the E. The Medicine Bow and Sierra Madre ranges are in the S. The Sweetwater Range lies on the S. side of Sweetwater River. The vast plain between the Sierra Madre Mountains and Green River is designated the "Red Desert." The highest peaks in the state are Fremont's Peak, 13,790 ft.; Grand Teton Peak, 13,690 ft.; Mount Sheridan, 13,691 ft. Mount Washburn, Elk, Laramie Mountains, and Index, Wyoming, and Gros Ventre peaks all exceed 10,000 ft. The most important rivers are the N. Platte, Green River, Yellowstone, Big Horn, Powder, Cheyenne, and Belle Fourche. Yellowstone Lake, situated in the Yellowstone National Park, is the largest body of water in Wyoming, being 22 m. long and 15 m. wide. Jackson's, Shoshone, Lewis, and Madison lakes lie S. and SE. of Yellowstone Lake, and NW. of the Wind River Range. Fremont and Boulder lakes lie near the base of Fremont's Peak, where the Green River, one of the largest tributaries of the Colorado, rises.

GREAT SEAL OF THE STATE OF WYOMING
EQUAL RIGHTS
1869
1890

The mineral deposits include a large percentage of coal, iron, gold, silver, graphite, asbestos, gypsum, bismuth, arsenic, alum, sulphur, copper, and red oxide of iron. Building stones of high commercial value are also found, comprising sandstone, limestone, granite, and marble. Petroleum has been found in many localities, and recent development has placed Wyoming oils on the market. The variety is lignite of a high order, containing from fifty to fifty-five per cent of fixed carbon, and being equal to many of the bituminous grades.

The soil of the uplands and plateaus is a light, sandy loam, and of the valleys a black loam, in some instances alkaline, but yielding bountifully when reduced by water. About 10,000,000 acres are suitable for agriculture by irrigation, 22,000,000 acres are mountainous, 18,000,000 acres consist of high table-lands, and 30,000,000 acres are covered with grasses and suitable for grazing. Below the timber line the mountains are covered with a thick growth of pine, spruce, and hemlock trees of large size; the foothills have some pine, spruce, aspen, walnut, elm, ash, box elder, and red cedar; and along the rivers and creek bottoms are found two species of cottonwood and thickets of willows. Many hundreds of flowering plants, mosses, and lichens are native. Abundant crops of tame grasses, such as alfalfa, red clover, bluestem, redtop, and timothy are grown. The agricultural productions include wheat, oats, barley, rye, buckwheat, and Indian corn. Potatoes are an important farm product of lower altitudes. Hardy fruits and berries thrive, and in the mountains, raspberries, strawberries, currants, gooseberries, chokeberries, and buffalo berries are native.

About thirty species of mammals, including the bear, wolf, coyote, mountain lion, wildcat, beaver, porcupine, mink, little ermine, moose, deer, and mountain sheep are found. About 125 species of birds are also found. Of the fifty or more species of fishes, there are mountain trout, several kinds of suckers, bass, sunfish, pike, etc. A state fish hatchery is maintained at Laramie, and branch hatcheries in the N. of the state. There are stringent laws for the protection and propagation of game and fish.

The average mean temperature for the year in the state is about 44°. The atmosphere is pure and rarefied, and cloudless days predominate. In the S. part of the state high winds sometimes prevail during the spring and autumn, but cyclones and tornadoes are unknown, and thunderstorms infrequent. Generally speaking, the climate of Wyoming is dry, mild, pleasant, and healthful.

The principal cities and towns are Cheyenne, Laramie, Rock Springs, Rawlins, Evanston, Sheridan, Green River, Casper, Newcastle, Lander, Douglas, Buffalo, Carbon. Within the limits of Fremont Co. is the Shoshone Indian Reservation, containing 1,520,000 acres of excellent land, and occupied by Shoshone and Arapahoe Indians. The Shoshone Indian Agency and Fort Washakie Military Reservation are on this tract. Fort D. A. Russell Military Reservation is 3 m. NW. of Cheyenne. Federal troops are also stationed at Rock Springs, in Sweetwater Co.

The most important industries of Wyoming are coal mining, stock raising, and banking. Wyoming has no shipping, the rivers and lakes not being navigable, and internal trade is conducted by railways or horse power. Total railway mileage is 1,588 m., the Union Pacific Railway, the Chicago, Burlington & Quincy, and the Chicago & Southwestern being the principal lines.

In 1908 the public schools had 899 teachers and 21,390 enrolled pupils. Teachers are trained in the normal school which is carried on in connection with the Univ. of Wyoming, at Laramie. This university was founded in 1887, and in 1909 had 41 professors and 275 students. Besides the normal school it comprehends an agricultural college, a school of mines, a college of mechanical engineering, a school of commerce, and a school of music.

The legislative department is composed of a state senate elected for four years, and a house of representatives, whose members are elected for two years. The legislature meets in the January of odd years, and sessions are limited to forty days. The elective state officers are the governor, secretary of state, auditor, treasurer, and superintendent of public instruction, all elected for four years. The courts comprise the supreme and district courts, and justices of the peace. The suffrage extends to all citizens, male and female, who can read, and who are registered as voters, and have resided in the state one year and in the county sixty days next preceding the election.

On July 25, 1868, Congress authorized the segregation of a part of the territories of Dakota, Utah, and Idaho, and the organization of the territory so segregated into the Territory of Wyoming. The territorial government was maintained until July 10, 1890, when Wyoming was admitted into the Union. The oldest white settlement is at Fort Laramie, on the Platte River, in the E. of the state, where a fur-trading post was established in 1834, rebuilt by the American Fur Company in 1836, and sold to the U. S. and garrisoned in 1849. Fort Bridger was established in the SW. of the state in 1842. Although the early settlers experienced the usual frontier contests with the Indians, there have been no serious outbreaks since the Custer Massacre by the Sioux of Dakota in 1876, and the Meeker Massacre by the Utes of Colorado in 1878.

Wyoming Mas'sacre. See Wyoming Valley.

Wyoming Val'ley, a fertile valley in Luzerne Co., Pa.; traversed by the N. branch of Susquehanna River. It was settled in 1762 from Connecticut, which colony claimed this region by virtue of its ancient charter, notwithstanding the protest of the government of Pennsylvania. In 1763 the settlers were either driven away or slain by the Delawares, but other Connecticut colonists went there in 1769, and for years were embroiled with other citizens, who recognized the government of Pennsylvania. In 1771, the British Govt. having confirmed the Connecticut claim, peace was restored, but in 1775 a force of Pennsylvanians attacked the settlements without success. During the Revolutionary War a large number of Tories from New York settled in the valley, which, from its seclusion, could not well be protected from hostile arms. Most of the able-bodied men were on duty with Washington when, on June 30, 1778, a body of 400 British troops and 700 Seneca Indians, with some Tories, invaded the valley. On July 3d the battle of Wyoming was fought between this force and some 300 settlers, chiefly boys and old men, who were driven into a fort, and after a desperate resistance, in the course of which about two thirds of their number were killed by the Tories and Indians, not even the prisoners being spared, were forced to capitulate, but the terms of the capitulation were not observed, and the greater part of the inhabitants were soon compelled by the Indians to flee from the valley.

In 1782, Congress decided the dispute as to jurisdiction in favor of Pennsylvania; but, when the authorities attempted to eject the Connecticut people, they again took up arms, and the contest lasted until 1788, when the Pennsylvania Legislature confirmed the titles of the residents; but for some twenty-five years there was much litigation in regard to the conflicting claims. This long series of contests was known as the "Pennymite wars," the settlers calling their opponents "Pennymites." Above Kingston, opposite Wilkesbarre, stands a granite obelisk which commemorates the slain in the contest of July 3, 1778.

X

X, the twenty-fourth letter of the English alphabet. In form it is probably an old variant of tau (T, +, X), just as the next letter of the Western alphabet Ψ (*ch*) was a variant of *upsilon*. The name *eks* has displaced the earlier *iks*. The sound is generally that of a double consonant: (1) *ks*, in *tax, axle, exile*; (2) *gz* before an accented vowel, as in *examine, example, exist, exhort*; (3) *ksh* (*kš*), as in *anxious, luxury*; (4) *gzh* (*gž*), in *luxurious, luxuriant*; (5) *z* initially, as in *Xerxes, Xenophon.*

X stands for ten in the Roman numerals, probably as representing one V (five) inverted upon another. In algebra *x* stands for the unknown quantity.

Xalapa (hă-lă'pă). See JALAPA.

Xanthus (zăn'thŭs), an ancient city of Asia Minor, in Lycia, on the river Xanthus, about 8 m. above its mouth. Its ruins were discovered in 1838 by Sir C. Fellows, and have yielded a large collection of marbles, now in the British Museum. The river rises in Mount Taurus, and falls into the Mediterranean a little to the W. of Patara.

Xavier (hă-vē-ăr'), **Francisco de.** See FRANCIS XAVIER.

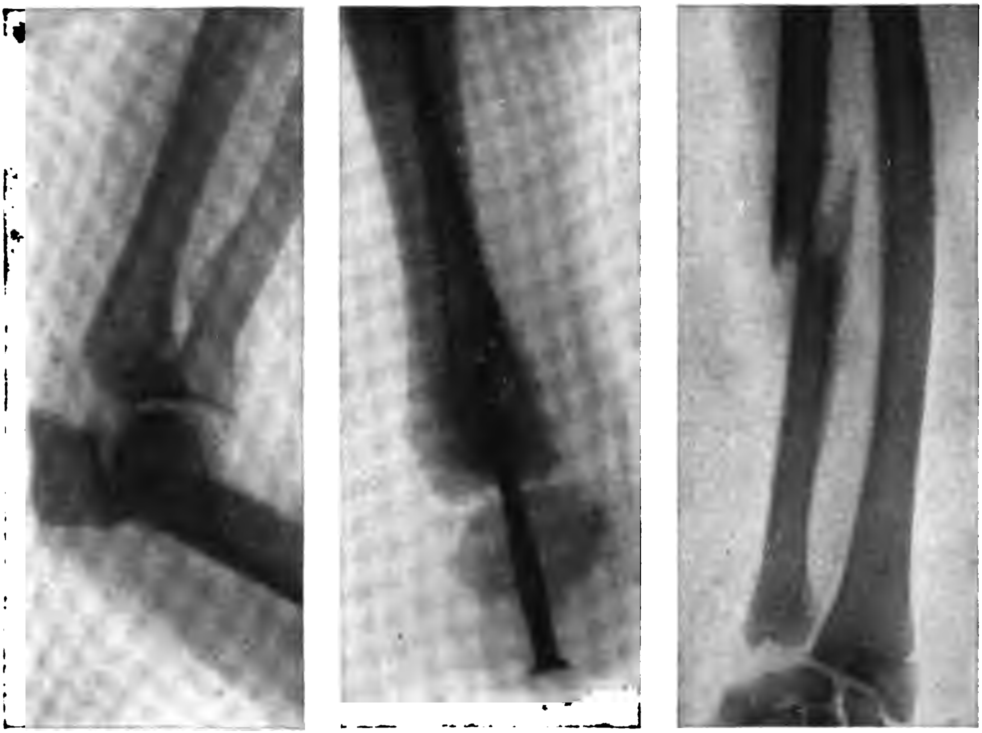
Xenocrates (zĕ-nŏk'ră-tēz), 396–314 B.C.; Greek philosopher; b. at Chalcedon; became a pupil of Plato, and gained his favor by his earnestness and energy, though the master was well aware of his slowness of comprehension and lack of elegance in manners. He accompanied Plato to Syracuse, and went after his death, together with Aristotle, to Asia Minor. Afterwards he returned to Athens, and succeeded Speusippus as chief of the Academy (in 339 B.C.), which position he occupied till his death. He was highly respected by the Athenians for the integrity of his character, and was repeatedly sent as an ambassador to foreign princes—Philip of Macedon, Antipater, etc. Aristotle respected him for his insight and knowledge, but of his works none has come down to us.

Xenon (zĕn'ŏn), a heavy gas which occurs in the atmosphere to the amount of one volume in 20,000,000.

Xenophon (zĕn'ō-fŏn), abt. 434–abt. 350 B.C.; Athenian writer. He was a pupil of Socrates. In 401 he went to Sardis and joined the expedition of the younger Cyrus. After the battle of Cunaxa the Greeks began that return to Europe famous as the retreat of the 10,000. When Clearchus and other Greek leaders had been treacherously massacred by Tissaphernes, Xenophon was elected one of the five generals, and came to be regarded as the head of the army. With skill he conducted the troops across Mesopotamia and through Armenia to Trapezus on the Euxine, and thence to Europe. His "Anabasis" is an account of this retreat. His "Hellenica" is a continuation of the history of Thucydides to the battle of Mantinea, and the "Cyropædia" a political romance, in which the author gives his ideas of the state, picturing the advantages of a wise monarchical rule. Several of his works are records of the acts and conversations of Socrates. Of these, by far the best known is the "Memorabilia."

Xenophon united in his person many of the best elements of a Greek gentleman. As a writer he was held up as the model of a simple style, and was called "The Attic Bee," by reason of the sweetness of his Atticism. Modern scholarship has made many deductions from the antique estimate, and closer criticism has shown that in long absence from Attica Xenophon lost much of the purity of Attic speech. He uses many poetical and dialectical words, and his syntax is not always constructed on Attic lines, and these faults, which enhance the human interest of Xenophon's style, have served to bring him into increasing disrepute with exacting Atticists.

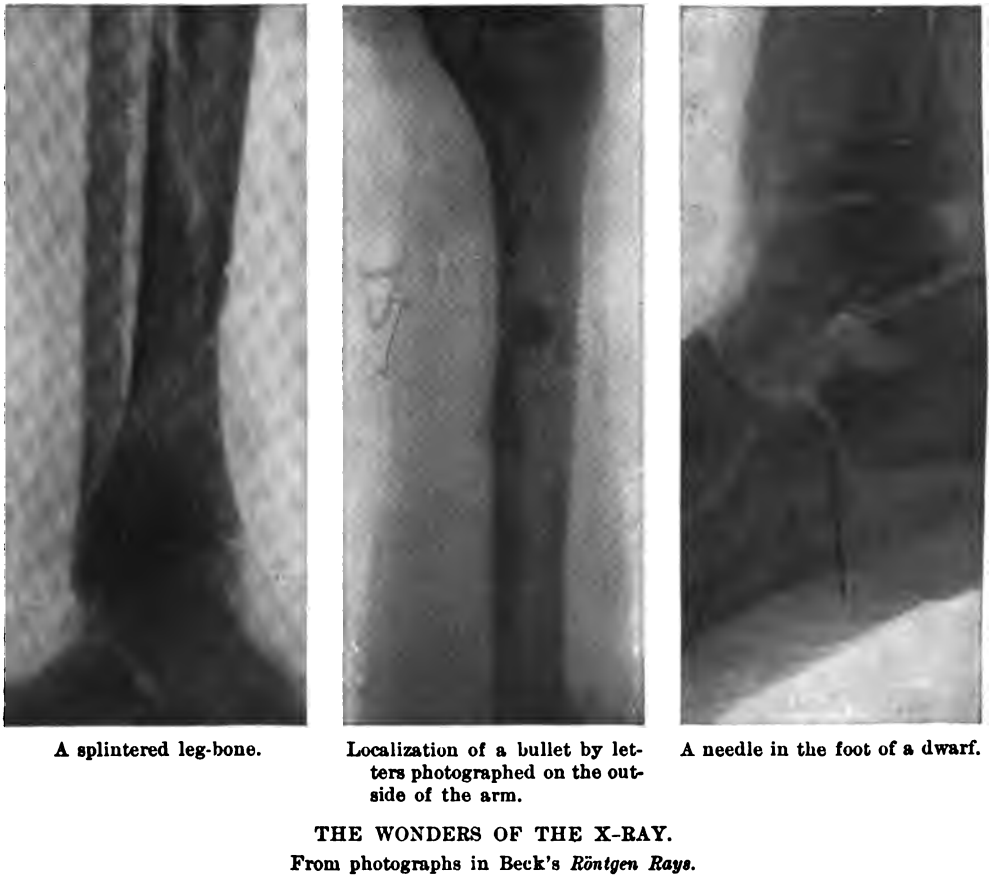
Xerxes (zẽrks'ēz), King of Persia, who reigned from 486 to 465 B.C.; son of Darius Hystaspes and Atossa. In 481 he assembled an immense army at Sardis for the invasion of Greece. Early in 480 the army began its march, and spent seven days and nights in crossing the Hellespont on two bridges. According to Herodotus, it amounted to 1,700,000 foot and 80,000 horse—the largest armament the world had ever seen. Besides these, upon the fleet of 1,207 ships of war and 3,000 smaller vessels and transports was a force which swelled the number of combatants to 2,317,000.



A broken elbow.

Fragments of bone joined by a screw.

A bad fracture.



A splintered leg-bone.

Localization of a bullet by letters photographed on the outside of the arm.

A needle in the foot of a dwarf.

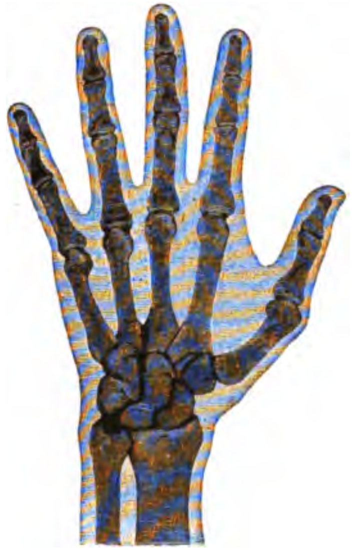
THE WONDERS OF THE X-RAY.

From photographs in Beck's *Röntgen Rays.*

The statement is doubtless exaggerated. The first resistance met was at Thermopylæ. In the meantime a storm destroyed many of the ships. The naval battles of Artemisium and Salamis followed, and Xerxes, who sat on his throne of gold, raised on a promontory, to witness the battle of Salamis, returned, panic stricken, to Asia, leaving Mardonius and 300,000 troops to continue the war in Greece. In 479 the disastrous battles of Platæa and Mycale occurred, followed by the utter overthrow of all the Persian power in Greece. In 465 Xerxes was murdered, and was succeeded by his son Artaxerxes. He is generally considered the Ahasuerus of the Book of Esther.

Ximenes (or Ximenez) De Cisneros (hē-mā′-nēs dā thēs-nā′rōs), **Francisco,** 1436–1517; Spanish prelate; b. Torrelaguna, Spain. He was advocate in the consistorial courts of Rome, 1459–75; entered a Franciscan convent in Toledo, 1482; and was confessor to Queen Isabella in 1492, provincial of his order in Castile, 1494, and Archbishop of Toledo and Primate of Spain, 1495. He began a vigorous scheme of reform among the clergy. His destruction of Arabic manuscripts was the immediate cause of the decay of Arabian literature in Spain; but he made some amends by founding, 1500–10, the Univ. of Alcalá de Henares, and by his polyglot Bible, called the Complutensian polyglot. In 1507 he received a cardinal's hat, and was appointed Inquisitor General of Castile. In 1509, chiefly at his expense, he conducted a successful expedition against Oran. Ferdinand at his death, 1516, left Ximenes regent of the kingdom until the arrival of his grandson, Charles I of Spain, afterwards Charles V of Germany.

X-Rays, a form of radiation excited by the passage of the alternating current from an induction coil through a partial vacuum; so called by their discoverer, Prof. Roentgen, from the unknown quantity x of algebra because their character was unknown to him; also called "Roentgen rays." When an electric current passes through an exhausted tube, rays called "cathode rays" proceed from the cathode, but are unable to traverse the walls of the tube. Where they impinge on these walls X-rays arise, and these pass outside the tube with ease. They pass also through many substances opaque to light, but are in general stopped by metals. The flesh of the human body is more transparent to them than the bones; hence, although they do not affect the human eye, they may be used to photograph the skeleton of a living person, or to locate bullets, or objects that have been swallowed. They cause a screen coated with some phosphorescent substance, like calcium sulphide, to emit light; hence the shadow cast by them becomes visible when cast on such a screen. They are thus very useful to surgeons in diagnosis; but it is necessary to use them with care, since continued exposure to them gives rise to a painful and apparently incurable hardening and ulceration of the tissues. It is now generally accepted by physicists that X-rays consist of detached impulses in the ether, being related to ordinary light somewhat as the noise of an electric "buzzer" to the tone from an organ pipe. See Kathode Rays.



X-Ray Photograph.

X Y Z Correspond′ence, the name given to the dispatches sent in 1797–98 to the U. S. Govt. by its commissioners, Charles Pinckney, John Marshall, and Elbridge Gerry, in Paris. These men were sent to France to settle certain difficulties with that government. On their arrival they were not received officially, but were compelled to communicate with the government through three agents, who informed them that the first step toward negotiation would be the payment of a large sum of money to the Directory, which was then in control of French affairs. The American commissioners, with the exception of Gerry, promptly withdrew and transmitted the correspondence to Pres. Adams, who, in turn, laid it before Congress, substituting for the names of the French commissioners the letters X Y Z. The correspondence aroused bitter feeling in the U. S., and a naval war with France was actually begun, but the French Govt. receded from its position, and thus averted a struggle.

Y

Y, the twenty-fifth letter of the English alphabet. It was simply the Greek letter upsilon, Υ. Prior to the adoption of the letter the sound had been rudely indicated by the Roman V (*u*); thus *cupressus, turannus, Æguptus.* The letter Y is therefore in its origin the same as V and U; cf. also W. As a vowel sign it stands for ī (*ai*), as in *my, cry, type, cycle, hyphen, tyrant, hybrid, cyclops, hyacinth,* or for ĭ, as in *hymn, syllable, syntax, myth, cynic, physics, beauty, happy, physician.* As a consonant, used only at the beginning of a syllable, it represents the consonant of ĭ; as in *yet, you, yolk.*

In algebra, y stands usually for the second unknown quantity.

Yachts and Yacht'ing. A yacht is a vessel of any size, propelled by sail, steam, or other motive power and used exclusively for pleasure purposes. The use of large pleasure craft specially devoted to royalty may be traced back to a very remote period, but yachting in its true sense began no earlier than the seventeenth century, while its establishment as a recognized sport falls within the nineteenth century. No hard line of demarcation can be drawn between the small sailboat or launch and the yacht; while at the other extreme is found the larger class of steam yachts, which differ but little in model and build from passenger steamers. The sailing yacht, as distinguished from the larger boats and from canoes, may be defined as a craft of from 20 to 100 ft. water-line length, wholly or partly decked, and with standing spars and rigging. The steam, naphtha, or electric yacht, as distinguished from the simple launch, is a craft of from 50 ft. water-line length upward, completely decked, and with permanent cabins. The upper limit of length in private steam yachts is about 250 ft. water line and 1,000 tons displacement.

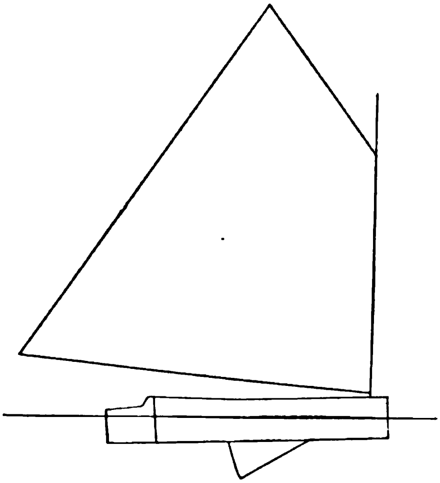


FIG. 1. AMERICAN CATBOAT WITH CENTERBOARD.

Sailing yachts may be divided into three types, according to the shape of the hull: (1) the keel yacht, with a deep body, of which the keel is an integral part; (2) the fin keel, with a very shoal body, to which is attached a deep-fixed fin, with the ballast in the form of a cigar-shaped mass of lead attached to the lower edge; and (3) the centerboard yacht, also with a shoal body, but relying for lateral resistance on a movable plane of wood or metal, so pivoted as to drop through the keel and below the bottom of the vessel. Almost every variety of rig is used on yachts; and although there is not, of necessity, a close connection between model and rig, it is frequently the case that certain rigs have been so closely associated with certain types of hull that the name of the rig is applied to both, as in the case of the catboat, the sloop, the cutter, and the lugger.

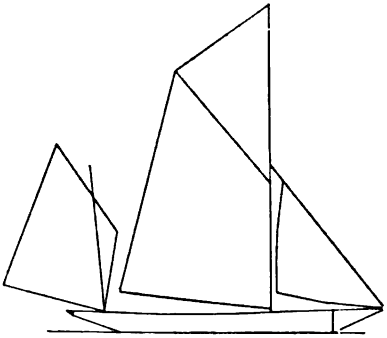


FIG. 2. YAWL RIG WITH LUG MIZZEN.

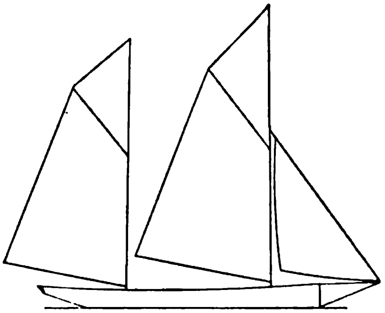


FIG. 3. KETCH RIG.

The simplest form of yacht is the centerboard catboat, the hull being wide, shallow, and usually lightly built, with no overhang at the ends; a wide, rectangular rudder hung outside the transom; a large centerboard, and with but one sail set on a gaff and boom, the mast being stepped as far forward as possible. These boats, ranging in length from 12 to 40 ft., are used in all the waters of the U. S. for racing, pleasure sailing, fishing, and general service, and, though easily capsizable, their light draught and speed make them adaptable to the shoal waters which abound. The sloop rig, the boom and gaff mainsail, with the addition of a large jib, is used on the same type of hull as the cat rig, but on larger, as well as the smaller, sizes, up to yachts of 70 ft. water line. In its simplest form, with a pole mast and only a jib and a mainsail, as used on the older racing boats, it is known as the "jib-and-mainsail" rig, but on decked yachts a topmast serves to carry a topsail and jib topsail. The cutter rig, still more complicated than the sloop, in that it has two headsails, a fore staysail in addition to the jib, has become in a modified form almost universal on decked yachts other than schooners in the U. S. The yawl rig, the cat-yawl rig, and the ketch rig are in principle similar to that of the sloop or cutter. The lug rig has a yard on the head of the sail, slung by a single halyard made fast near the middle, instead of a gaff with jaws which slide on the mast. This rig is used on yachts of all types, being the favorite racing rig for the smaller racing yachts in Great Britain, though it is chiefly associated with the fast smugglers of the early part of the nineteenth century. The sharpie is a shoal-draught vessel, used extensively in the U. S. for oystering, as well as for pleasure sailing. The bottom is flat, the sides slightly flared outward at the deck, the stem straight, and the stern is carried out into a long counter, with a round end. The centerboard is long rather than deep, and the rudder is of the balance variety, there being no rudder post or scag. The rig consists of two masts, each long and flexible and carrying a leg-o'-mutton sail extended by a long sprit running across from the mast to the clew. The foremast is stepped in the bows and the mainmast just abaft the middle of the boat. The schooner rig, used on yachts of from 60 ft. upward, has two masts, the fore and main, the latter carrying the larger sail, and the bowsprit and headsails are rigged like those of the cutter.

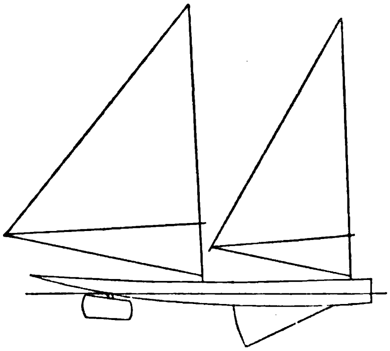


FIG. 4. SHARPIE.

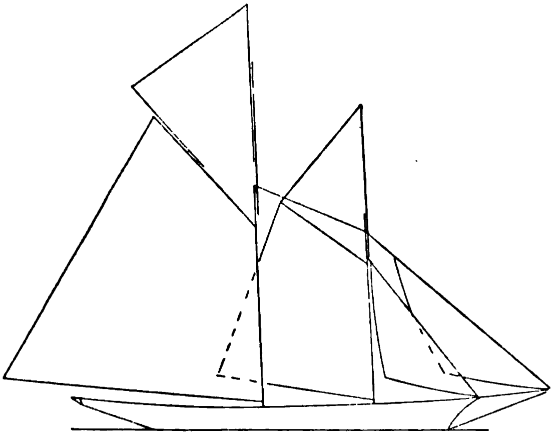


FIG. 5. MODERN SCHOONER RIG.

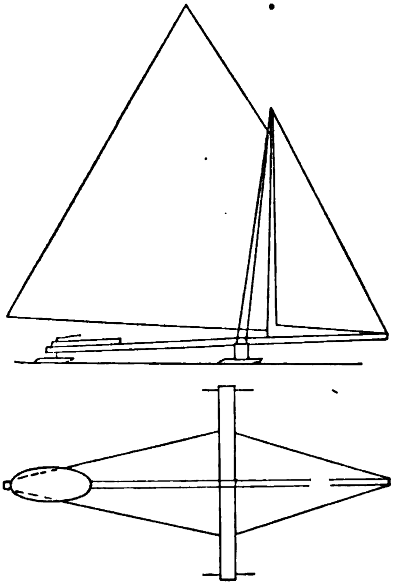


FIG. 6. HUDSON RIVER ICE YACHT (with plan).

An ice yacht is not properly a vessel, but a machine for sailing on ice. It consists of a light framework of wood resting on three large runners, the after one movable and fitted with a tiller. A mast is stepped in the center of the framework, on which one or two sails are carried, the sloop rig being the most common, though the cat rig is sometimes used. Under favorable conditions the boats are capable of very high speed, and are used throughout the N. U. S. for racing.

The first yacht club, the "Water Club of the Harbour of Cork" (Ireland), was founded in 1720. The sport made little progress until, in 1812, there was founded at Cowes, Isle of Wight, the "Yacht Club," which still exists as the "Royal Yacht Squadron." The first yacht club in the U. S. was the "New York Yacht Club," founded in 1844, mainly through the efforts of Col. John C. Stevens and his brother Edwin.

The yachts of 1800 to 1830 were of all sizes, rigs, and models, being built primarily for cruising, with racing as a mere incident. All sizes and rigs were classed together for racing purposes, with only the crudest attempts to compensate for difference in size by time allowance. The first time allowances made in Great Britain (abt. 1815) for differences in size were based on the tonnage of the competing yachts. This rule was never adopted by the yachtsmen of the U. S., who based their allowances upon calculations depending on displacement, length, sail areas and other factors. In 1883 the "Seawanhaka rule," providing that the yacht should be rated by adding the length on the water line to the square root of the sail area and dividing the sum by two, was formulated, and is now commonly used in the U. S. By the present "rating rule" of Great Britain the length and sail area are multiplied together and the product divided by 6,000, the quotient being the "rating" of the yacht.

Yak, a bovine animal of Tibet. It is about the size of a small ox, very hairy, and has a long sweeping tail. The legs and neck are short, horns small and half hidden in the long hair; the shoulders bear a mass of hair which suggests a hump. The wild yak is much less shaggy than the domesticated variety, and of a nearly uniform deep brown or blackish color. The domesticated animals are generally black or white, or black and white, the latter most commonly. Its hair is not coarse, though long and thick; and though the creature when wild and disturbed or wounded may prove fierce, it can be easily domesticated. Its hair protects it from the cold of the mountain heights which it frequents. It is a sure-footed animal, climbing over rocks with the agility of a chamois. It is found in the plateau region between the Altai and Himalaya Mountains, up to an altitude of 20,000 ft. The Tibetans keep large flocks of yaks, and the milk is prized. It is rich and yellow, and has a strong but pleasant odor. The yak does not low like an ox, but has a sharp, quick, deep voice, similar to the grunt of a boar. Its flesh is superior to venison. The Tibetans use its skin for clothing.

YAK.

Yale, Elihu, 1638–1721; American philanthropist; b. in or near Boston, Mass.; went to India to engage in trade abt. 1670; was governor of the East India Company's settlement at Madras, 1687–92; amassed a fortune; returned to England, 1699; became interested in the "Collegiate School" at Saybrook, Conn.; favored it instead of bestowing a charity upon a college at Oxford. In 1745 his name, at first applied to a building, was extended to the whole institution.

Yale Univer'sity, an institution of learning chartered as the "Collegiate School of Connecticut" by the General Assembly of the colony of Connecticut, October, 1701. The minister of New Haven, James Pierpont, in concert with nine other Congregational ministers, most of whom were of the Connecticut seaboard, had founded the Collegiate School in September, 1701. The school was formally established at Saybrook in November, 1701, though the classes until 1707 were taught at Killingworth (now Clinton), an adjoining town, where Abraham Pierson, the first rector, was pastor. The school was permanently settled in New Haven in 1716, and in 1718 its name was changed to Yale College, in recognition of a large gift from Elihu Yale, of London. Down to the period of the Revolution the college received from the Colonial Govt. stated or occasional grants of funds. In 1792 the governor, lieutenant governor, and six senior senators of the state were made, *ex officio*, members of the corporation, the state making at the same time a grant valued at $30,000 to the college funds. In January, 1887, the use of the title, Yale University, was authorized by the General Assembly. For the first one hundred years instruction was given chiefly by the rector or president, assisted by two or three tutors chosen from among the recent graduates, and serving for brief periods. A Prof. of Divinity (or college pastor) was appointed in 1755, and in 1770 a Prof. of Mathematics, though the chair was not permanently occupied till 1794. It was not until the nineteenth century that the system of permanent professors, assisted still by temporary instructors, was fully established. There are four departments of instruction grouped under the name of Yale Univ., *viz.*, the departments of philosophy and the arts, of theology, of law, and of medicine, the first of these including the academical department (the original Yale College), the Sheffield Scientific School, the School of the Fine Arts, the musical department, and the courses of graduate (of advanced nonprofessional) instruction. The number of students enrolled in 1909 was 3,276; of instructors, 400.

The University Library is open to students in all departments. In the same building is a separate library, supported by the undergraduates, and devoted to general literature. There are also special libraries. The total number of volumes in the several libraries of the university is about 575,000. The Peabody Museum of Natural History, devoted chiefly to zoölogy, geology, and mineralogy, was established by a gift of $150,000 from George Peabody, of London, in 1866. The total value of the property, including the endowment of the university, is about $9,500,000.

Yam, the tuberous root of species of climbing vines of the family *Dioscoreaceæ.* Yams are extensively grown in all warm countries as food. Some of the wild sorts are nauseous and even poisonous. Yams are successfully grown in the S. parts of the U. S., and the Chinese yam (*D. batatas*, or properly *D. divaricata*) thrives in the N. parts, but its great roots, though often of excellent quality, have a tendency to bury themselves so deeply in the earth that they can only be reached at considerable trouble. The air potato bears large edible tubers in the axils of the leaves. The term yam is also applied to various forms of the sweet potato.

YAM.

Yangtze (yăng′tsē), one of the two great rivers of China; is formed by two streams rising in E. Tibet, in lat. 26° 30′ N., lon. 102° E., and, after flowing E. and then S., enters the Chinese province of Yunnan. Its whole course, under various names, is 2,900 m., and the area of its basin is computed to be 548,000 sq. m. It is connected by the Grand Canal with the Hwang-ho or Yellow River, and is navigable for vessels of considerable draught for 1,200 m. from its mouth. By the Treaty of Tien-tsin the lower Yangtze was opened to European trade, and 700 m. from its mouth is the treaty port of Hangkow, the great commercial port of mid-China. The highest port on the river at present reached by steamers is the treaty port, Ichang, 1,000 m. from its mouth.

Yan′kee, a cant name for Americans belonging to the New England states. During the American Revolution the name was applied by the British to all the insurgents; and during the Civil War it was the common designation of the Federal soldiers by the Confederates. The most common explanation of the term seems also the most plausible, namely, that it is a corrupt pronunciation of *English* or of French *Anglais* formerly current among the American Indians.

Yankee-Doo′dle, a national air of the U. S.; originally known under the title of "The Yankee's Return from Camp." It is reported to have been a popular tune in England during the Commonwealth, at which time its doggerel words originated. Others say that it was the tune originally set to the old English song "Lydia Locket Lost Her Pocket," and that the words now used were composed in 1755 by Dr. Schuckburgh, a British surgeon who served under Gen. Amherst during the French and Indian War in N. America, and who took this means of ridiculing the colonial militia. Still other accounts of its origin are given. It was introduced by Samuel Arnold into his opera "Two to One."

Yapurá (yä-pô-rä′), also written JAPURÁ, HYAPURÁ, the name given by Brazilians to a N. affluent of the Amazon, known in its upper course in Colombia as the Caqueta. It is the first great Amazonian affluent above the Negro; rises in the Andes; length probably not far from 1,500 m., and river steamers can ascend to the Cupaty Fall, about 620 m. Above the fall there is another navigable space of several hundred miles.

Yar′mouth, town in the counties of Norfolk and Suffolk, England; 122 m. NNE. of London; stands on a tongue of land between the North Sea and the Yare, along the bank of which runs a quay nearly 2 m. long. It is the principal seat of the English herring fisheries on the E. coast, and considerable deep-sea fishing is also carried on, the produce of which is daily carried to London. Silk goods, ropes, sails, and iron are manufactured, and coasting vessels are built here. The Church of St. Nicholas, founded by Herbert de Losinga early in the twelfth century, and restored 1847–84, is one of the largest parish churches in England. Pop. (1901) 51,316.

Yaroslav (yä-rō-släv′), capital of the government of Yaroslav, Russia; at the confluence of the Kotorost and the Volga; 173 m. NE. of Moscow. It is the seat of the civil governor and an archbishop. The right bank of the Volga is bordered by a beautiful quay for nearly 2 m.; the suburbs are on the left bank. The city has sixty-six churches, the Uspenskij Cathedral (begun in 1215) and several very old churches, a theological seminary, three monasteries, a lyceum with a law faculty, and three gymnasia. There are many factories for linen and cotton goods, bell foundries, silk factories, and a very active traffic with Moscow and St. Petersburg. The village Velikoje Selô, in the district of Yaroslav, is the center of linen manufacturing which is famous all over Russia. It produces goods valued at 6,000,000 rubles annually. The town of Jaroslav, in Austrian Galicia, on the Cracow-Lemberg Railway, must not be confounded with Russian Yaroslav. Pop. (1907) 71,616.

Yates, Richard, 1818–73; American political leader; b. Warsaw, Ky.; became a resident of Springfield, Ill.; graduated at Illinois College, 1838; studied law, and practiced at Springfield; served in the Illinois Legislature, 1842–49; elected to Congress on the Whig ticket, 1850; Governor of Illinois, 1860 and 1862; took an active part in raising troops for the Union army; appointed by U. S. Grant mustering officer for the state, and subsequently colonel of the Twenty-first Illinois Regiment; served as U. S. Senator from Illinois, 1865–71.

Yavari (yä-vä-rē'), affluent of the Amazon, forming part of the boundary between Brazil and Peru; lower portion very crooked, and flows in a narrow valley through heavy forests.

Yawn'ing, an act consisting of a deep inspiration, accompanied by an involuntary opening of the jaws to the fullest extent. It differs from sighing in these points—that it is entirely involuntary, and that it is evidence of mental weariness. Its exciting cause is imperfect aëration of the blood, and it is sometimes a symptom of certain brain diseases. Yawning is performed by some animals, as the dog, probably from similar causes.

Yazoo' Fraud, name popularly applied to the sale by Georgia in 1795 of the greater portion of her W. territory. In 1789 the State of Georgia sold to certain companies lands estimated at 13,500,000 acres for about $200,000. Certain difficulties both as to the Indian title and the currency in which the purchasers were entitled to pay having arisen, the legislature repealed the act. These sales seem to have been practically inoperative; but in 1795 the State of Georgia sold to four companies—known in history as the Yazoo Companies—for $500,000 about 35,000,000 acres of W. lands. This sale excited the apprehension of the Federal Govt., to whose notice it was brought by a message of Pres. Washington; but in Georgia it aroused especial indignation, for there was strong evidence of legislative corruption. All acts authorizing the sale were repealed, the purchase money paid was ordered to be returned, the records of the transaction were publicly burned, and in 1802 Georgia ceded all this W. territory to the U. S., and the Federal Govt. subsequently recommended that the claimants be compensated in land or money. The popular feeling, however, against the transaction prevented any action by Congress. The claimants finally sought their remedy in the U. S. courts, and the case was carried by appeal to the Supreme Court of the U. S. In Fletcher *vs.* Peck, Chief Justice Marshall in 1810 held that the original sale by the State of Georgia must be sustained; that the allegation of corruption on the part of the legislature could not be entertained by the court; that purchasers from the land companies were innocent holders without notice; that the repealing act of the Georgia Legislature could not divest them of the rights thus acquired. Consequently, in 1814 Congress appropriated $5,000,000, to be raised by the sales of the lands, to quiet and extinguish all the Yazoo claims.

Yazoo Riv'er, in the Choctaw language, "River of Death," alluding to the malarial diseases which prevailed upon its shores, a navigable stream of Mississippi; originates in the Yazoo Pass, Coldwater River, Beaver Dam River, and other bayous and sloughs springing from the E. bank of the Mississippi River, and joins the Tallahatchie. The Yazoo proper is 290 m. long, deep, serpentine and sluggish, and navigable the year round. It joins the Mississippi 12 m. above Vicksburg.

Year, a full round of the seasons. First there is the solar, tropical, or equinoctial year, defined as the mean interval between two returns of the sun to the vernal equinox. The length of this year is 365 days 5 hours 48 minutes 46 seconds, and it diminishes about half a second in a century owing to a change in the annual precession of the equinoxes. Since the apparent motion of the sun or the real motion of the earth, relative to the equinox, determines the changes of the seasons, this year is regarded as the principal one for practical purposes. It is also the principal year for astronomical purposes, because it corresponds to one revolution of the earth in longitude.

The years which have branched off, as it were, from the solar year are, principally, our "common year" of 365 days, and leap year, or bissextile year, of 366 days. The Julian year is one fourth the length of four consecutive years of the Julian calendar, or 365¼ days. A "lunar year" of twelve lunar months, or 354 days nearly, was sometimes used by nations whose religious feasts were regulated by the moon, notably by the Mohammedans, among the seasons of the beginning of the year. The Roman year, before the time of Julius Cæsar, began on March 1st. The civil year of the Jews began at the autumnal equinox, though their sacred year began at the vernal. The Greek year, before the time of Meton, began at the winter solstice; afterwards at the summer solstice. The Egyptians, Persians, and other Eastern peoples began, like the Jews, at the autumnal equinox. The Mohammedan year, being a lunar year, has no determinate epoch, but continually goes backward among the seasons. September 1st was the beginning of the year in the Eastern Empire, and the same was true in Russia before the time of Peter the Great. In France, under the Merovingian kings, the year began March 1st; under the Carlovingians, March 25th; under the Capetians, at Easter; and after 1564, on January 1st. The ancient N. nations of Europe placed the beginning of the year at the winter solstice. In England the year began on March 25th, previously to the adoption of the Gregorian calendar, which took place in 1752. The same usage prevailed in the British-American colonies from Nova Scotia to Georgia, and was abandoned at the same time.

Year and a Day, a complete calendar year. The day was added because the common law recognized no parts of a day, and therefore treated the last day of any period as ending at the very moment of its beginning. In accordance with this rule, an infant attained full age at the beginning of the last day of his twenty-first year. The period of a full year, or of "a year and a day," was adopted as an arbitrary limit in many cases. By the feudal law the heir of the tenant was required to claim within that period, or he lost his land. The same limitation was imposed upon the claim of a tenant against his disseizor; and upon that of the owner of an estray, or of the owner of wrecked property, or upon the issuing of an execution on a judgment.

Yeast. See FERMENTATION.

Yeisk, or **Jeisk** (yā'isk), town in the territory of the Kuban Cossacks, Russia; on the Sea of Azov, 65 m. SW. of Azov; was founded 1848 as a port for the rich produce of the surrounding country, and has grown very rapidly. Pop. (1907) 35,414.

Yel'lowbird, the common name given in the U. S. to two varieties of birds, the American goldfinch (*Spinus tristis*) and the yellow warbler or summer yellowbird (*Dendroica æstiva*).

Yel'low Fe'ver, a disease so called because of the peculiar yellow tinge of the skin characterizing it, and for the same reason technically designated typhus icterode, icterus being the classical name of "yellow jaundice." Yellow fever prevails chiefly in tropical and warm climates. When occurring in temperate or cold zones, it has been imported in the course of commercial travel. It is indigenous chiefly in the W. Indies, upper coasts of S. America, and the borders of the Gulf of Mexico. It occurs in isolated, sporadic cases at all seasons in seaports to which it has been transported in ships. Rigid quarantine of all ships coming from yellow-fever localities, and their fumigation before disembarking passengers and cargo, have averted the epidemics formerly so frequent.

Yellow-hammer, the *Emberiza citrinella,* a very common and handsome bunting of Europe and W. Asia. In Italy it is fattened and eaten. In the U. S. the name is sometimes applied to the flicker, or golden-winged woodpecker, *Colaptes auratus.*

Yellow Riv'er (in Chinese HWANG-HO), one of the principal rivers of China; sometimes called "China's sorrow," from its unruliness, and the destruction and loss of life caused by its frequent change of course and the bursting of its banks. Its principal affluent is the Wei.

Yellow Sea (in Chinese HWANG-HAI), formerly sometimes written WHANG-HAI and HOANG-HAI, those waters of the Pacific Ocean which border on the Chinese provinces of Chehkiang, Kiang-su, Shantung, and Chih-li, and are discolored by the large amount of yellowish mud which the Hwang-ho and the Yangtze-Kiang carry with them to the ocean. It is rather shallow and its depth is steadily diminishing.

Yel'lowstone Na'tional Park, a reserved tract situated in the NW. corner of the State of Wyoming, with a strip of country less than 2 m. in width lying on the N. in Montana, and a still narrower strip extending westward into Idaho. Its boundaries, as determined by act of Congress setting apart the park, are ill defined. It is a rugged country, embracing a little more than 3,300 sq. m.

In the summer of 1870 H. D. Washburne, Surveyor General of Montana, traversed the region and published the first detailed account of it. In the following year Dr. Ferdinand V. Hayden, U. S. Geologist, visited the region. Upon his earnest solicitation, Congress passed a law dedicating the park and defining its boundaries as a public park or pleasure ground for the benefit and enjoyment of the people. The act was approved March 1, 1872.

The central portion of the park is a broad, volcanic plateau between 7,000 and 8,500 ft. above sea level, with an average elevation of 8,000 ft. Surrounding it on all sides are mountain ranges with prominent peaks and ridges rising from 2,000 to 4,000 ft. above the general level of the inclosed table-land. Out of this plateau rise two prominent peaks—Mt. Washburne and Mt. Sheridan—from both of which have poured forth enormous masses of lavas. Across the plateau from the SE. to the NW. stretches the Continental Divide, separating the waters of the Atlantic from those of the Pacific. Numerous streams coming down from the high mountains supply large quantities of water to the lakes and ponds. The Yellowstone River, the longest branch of the Missouri, finds its source in Yellowstone Lake; the Snake in Shoshone Lake.

About eighty-five per cent of the park is forest clad; the bare portions are mainly areas above timber line, steep slopes, and wet, marshy bottoms. The forest is essentially coniferous. With the exception of the Rocky Mountain goat, all the larger game of the Rocky Mountains roam in the park. A few small herds of buffalo roam over the park, grazing most of the time in out-of-the-way places. Since their protection by the Government, they are rapidly increasing.

Yellowstone Lake measures 20 m. in length, with a breadth of 15 m. It has an elevation of 7,741 ft. above sea level, and is the largest lake at so high an altitude in N. America. The cañon of the Yellowstone far excels in beauty all other marvelous sights in the park.

The natural objects that have made the Yellowstone region famous are mainly its geysers and hot springs. Eruptions of lava ceased long ago, but over the park plateau evidences of internal heat are everywhere to be seen. The number of hot springs scattered over the park is nearly 4,000. In the four principal geyser basins (Norris, Midway, Upper and Lower Geyser Basin) eighty-four geysers are known to have been active since the days of the earliest exploration. Probably there are 100 geysers within the park. The Giant, Giantess, Grand, Splendid, Grotto, Castle, Beehive, Oblong, and Old Faithful are all within a short distance of each other. Old Faithful was so named on account of its great regularity; for over twenty years it has been playing at intervals averaging sixty-five minutes. All the larger geysers throw columns of water varying from 70 to 250 ft.

Government of the Park.—The Yellowstone Park is under the supervision of the Secretary of the Interior, who is authorized to make all necessary rules and regulations for its government and protection. The superintendent is an army officer, with headquarters at the Mammoth Hot Springs. Nobody is allowed to reside permanently in the park without special permit. All shooting is strictly prohibited, and the capture and trapping of game is forbidden. Fishing for pleasure and for food while in the park is permitted, but is strictly prohibited for commercial purposes. Every precaution is taken to prevent forest fires. There are several hotels in the park, and these are connected by good roads maintained by the Government.

Yemen (yĕm'ĕn), a province of the Ottoman Empire in Arabia; has the Red Sea on the W. The coast line is about 500 m. in length, and the total area 73,800 sq. m.; pop. est. at abt. 750,000. It consists of a maritime lowland belt, mostly sandy and sterile, but in places tropically fertile, and of table-land some 4,000 ft. above the sea, and between these two of a chain of heavily wooded mountains running N. and S., with peaks from 6,000 to 8,000 ft. high. The former capital, Hodeida, a most unhealthful city, is the principal port. Other ports are Mocha, famous for its coffee, but now almost abandoned, and Loheia. The principal exports are coffee, skins, senna, indigo, gums, dates, tamarinds, and ivory.

The earliest inhabitants are supposed to have belonged to the Hamitic race. Descendants of the Semitic Sheba (Gen. x, 28) came afterwards. From their amalgamation arose the celebrated Himyaritic Kingdom, abt. 700 B.C. The high civilization of this kingdom is attested by hundreds of inscriptions, coins, and works of art. Various attempts at conversion of the country to Christianity, as by Theophilus, a missionary sent by Constantius II in 356, had small permanent result. The king Abu Novas, who reigned toward the end of the fifth century, professed Judaism and massacred the Christians. In consequence he was conquered by the Negus of Abyssinia (525), whom Justin I had instigated to revenge his coreligionists. The Persians replaced the Abyssinians in 575, and the whole province submitted to Mohammed and Islam in 628. The Ottomans have exercised a precarious authority over Yemen since 1538.

Yenikale, or Jenikale (yĕn-ē-kä'lā), **Straits of** (anciently, *Cimmerius Bosphorus*), the body of water connecting the Sea of Azov with the Black Sea. It is 19 m. long, about 3 m. wide where narrowest, and very shallow. The S. part is called Strait of Kertch.

Yenisei (yĕn-ē-sä'ē), longest of the great rivers of Siberia, watering the immense Yeniseisk province through its whole length. It rises in the NW. of Mongolia in several branches. Below Krasnoyarsk it receives a great tributary, the Kan, and farther N. the Angara and others, and empties into the Arctic in a deep estuary, the Yenisei indentation or the Liman of Seventy Islands, icebound almost all the year round. Its total course is more than 3,000 m. long, and is navigable from Minusinsk, though there is a series of rapids in the middle course between Krasnojarsk and Yeniseisk.

Yew, the common name of evergreen coniferous trees of the genus *Taxus*, and sometimes extended to the others of the family *Taxeæ*. The common yew tree (*T. baccata*) of Europe is often planted in churchyards, because of its gloomy appearance. Its leaves and seeds are poisonous. Its wood is very hard, elastic, and durable, and was once in great repute for bows. Of its varieties the Irish yew is the finest. *T. canadensis* is a prostrate American sort, very common in the N.

Yew.

Yezo (yĕz'ō), less correctly Yesso; Japanese, Hokkaido, the most N. of the great islands of Japan, and until recently treated as a colony; its area, with small adjacent islands, is 36,299 sq. m. Pop. (1904) 843,717, including 18,000 Ainos.

The surface of the country is broken and mountainous, and a large portion remains imperfectly explored. The highest summit is Mt. Tokachi, 8,200 ft. in height. The chief river is the Ishikari, flowing W. into the Japan Sea, a stream abounding in salmon. Hakodate, with its magnificent harbor, is the most important town on the island. It was thinly settled, and the new rulers of Japan, fearing Russian aggression, undertook a comprehensive colonization scheme. A special department, the Kaitakushi, was founded, and a number of Americans, with Gen. Horace Capron at their head, were in 1871 engaged as advisers. They spent large sums on internal improvements, but, as no adequate returns followed, the island was divided into prefectures, like the rest of Japan. The interior still remains for the most part covered with primeval forest, inhabited by deer and bears. For six months of the year the island is under ice and snow; the summers, though short, are hot, and insect life abounds in the shape of mosquitoes and gadflies. The chief Aino villages are found on the SE. coast, the W. coast immediately N. of Matsumaye being settled by a Japanese fishing population.

Ygdrasyl (ĭg'dră-sĭl), in Scandinavian mythology, the greatest and most sublime of all trees, the ash, whose branches spread over all the world and aspire above heaven itself. It is the symbol of the universe. Beneath one of its roots is the fountain of wisdom, and beneath another is the meeting place of the gods. Odin once hung nine days and nine nights in this tree, sacrificing himself to himself. It is believed that Ygdrasyl is the origin of the Christmas tree.

Yokohama (yō-kō-hä'mä), literally, "cross-beach," an important town and the chief port of foreign entry in Japan; on the W. shore of the Bay of Tokyo and about 18 m. S. of Tokyo, on the main line of railway between Tokyo and Kioto. The town sprang up almost by accident at the time of the opening of the country, the original treaty port being Kanagawa, on the N. shore of a small bay, now closed in. Impatient of the obstructions placed in the way of their securing ground for their warehouses, foreign merchants established themselves at the small fishing village of Yokohama, 2 m. distant by water. The town divides itself into three parts: (1) The "native town"; (2) the foreign settlement, where are the foreign business houses, built on flat ground at one time mostly a marsh or swamp; and (3) the Bluff, a well-wooded hill to the S. of the settlement, where most of the foreign private residences are. There is a good roadstead; a harbor, suitable for the accommodation of the largest vessels, and a graving dock. It is also the chief silk emporium; as a tea emporium, it is yielding to Hiogo. The chief imports are cotton yarns, sugar, kerosene, woolens, bar iron, wire nails. The foreign consuls general are established here and several of the legations. In 1904 the pop. numbered 326,035.

Yon'kers, city of Westchester Co., N. Y.; on the Hudson and Bronx rivers and the New York Central & Hudson River Railroad; 18 m. N. of the New York City Hall. It has a frontage of more than 4 m. on the Hudson River, extends E. for 6½ m. along the Bronx River, and is built on a series of terraces which rise from the Hudson to a height of 425 ft. above tide water. The city is noted for its beautiful residences and for its manufacturing interests. The principal industries are the manufacture of carpets and hats, elevators, refined sugar, maltine, tools, chemicals, and insulated goods, and the handling of grain, for which there is a large elevator. Pop. (1910) est. at 80,000.

York, Dukes of, a title often conferred upon younger sons of the kings of England, some of whom have come to the throne through the decease of their elder brothers.

York, capital of Yorkshire, England; at the confluence of the Ouse and the Foss; 188 m. N. of London; and is one of the oldest and most interesting cities of England. It is surrounded with walls, 2¾ m. in circuit, dating mainly from the reign of Edward III, and is generally closely built, with narrow streets and curious, old-fashioned houses. Its cathedral, built from the eleventh to the fourteenth century, and one of the finest specimens of Gothic architecture in the world, is built in the form of a cross, 524 ft. long, 250 ft. broad across the transepts, with a square, massive tower, 216 ft. high, rising over the crossing, and two elegant towers, 201 ft. high, flanking the W. front. The castle, in which the assize courts are still held, dates from the reign of Edward I. Its manufactures and trade are not important. It is the seat of the Archbishop of York. In the time of the Romans, York was the seat of the general government for the whole province of Britannia; Septimius Severus and Constantius Chlorus died here, and here Constantine the Great was proclaimed emperor. In the Saxon period it was the capital of Northumbria, and afterwards of Deira, and in connection with the Scots and the Danes it offered a fierce resistance to William the Conqueror, who after taking it razed it to the ground. It was only partially rebuilt, and suffered much by fire in 1137. Pop. (1901) 77,914.

York, capital of York Co., Pa.; on the Codorus Creek; 96 m. W. of Philadelphia. It is laid out in quadrangles designed to be 480 ft. wide by 520 ft. long, and has a slightly undulating surface and excellent drainage. The principal industries are the manufacture of agricultural implements, passenger and freight railway cars, turbine water wheels, rolled metals, ice machines and refrigerators, safes, electric power machinery, wagons and carriages, wall paper, iron, flour, candy, chains, crackers, carpets, cigars, and wire cloth. Pop. (1900) 116,413.

York and Lan'caster, Wars of. See ROSES, WAR OF THE.

York'town, Siege of, a notable siege sustained by the village of Yorktown, Va., during the War of the American Revolution. Lord Cornwallis, posted here with a force of more than 8,000 men and supported by several frigates anchored in York River, was in the latter part of September, 1781, besieged by the combined American and French forces under Washington and Lafayette, numbering about 16,000 men. On October 9th fire was opened, and on the following evening a British frigate and three large transports were destroyed. A successful attack was made upon the besiegers on the night of the 14th, but a large French fleet under Count de Grasse prevented Cornwallis from receiving the reënforcements sent to him by Sir Henry Clinton from New York. On the 16th he made an ineffectual sortie; on the next day offered to capitulate, and on the 19th surrendered his whole force of 7,247 regular troops, 840 sailors, with 235 guns. The entire British loss in killed, wounded, and missing was about 550; that of the Americans and French, about 300. This surrender virtually brought the War of the Revolution to a close.

Yosemite (yō-sĕm'ĭ-tē) **Val'ley,** a region of remarkable scenic attraction in the Sierra Nevadas of California, about 150 m. SE. of San Francisco, and discovered in 1851 by a party of settlers in the vicinity of the mining camp of Mariposa while in pursuit of a band of troublesome Indians, who were ascertained to have a stronghold in the mountains. The word *Yosemite* means "a full-grown grizzly bear," and was the aboriginal name of a noted chief.

The Yosemite Valley has very much the character of a gorge or trough hollowed in the mountains in a direction nearly at right angles to their general trend, and lies midway between the E. and W. bases of the Sierra. It is a level area, about 6 m. in length and from half a mile to a mile in width, and is sunk nearly a mile in depth below the general level of the adjacent region. The river Merced runs through the Yosemite. Two branches—the Tenaya Fork and the Illilouette—of the main Merced also enter the valley near its head.

In entering the Yosemite from the lower ends, the visitor passes from a V-shaped gorge, or cañon, into one which may be fairly called U-shaped, since its walls rise almost vertically. On the N. side of the valley is the mass of rock called El Capitan, and, exactly opposite, the Bridal Veil and Cathedral Rocks. At this point the distance across the valley is only a mile, and at the base of these cliffs there is just room for the river to pass. El Capitan is an immense block of granite projecting squarely out into the valley, and presenting two almost vertical faces which meet in a sharp edge 3,300 ft. in perpendicular elevation. Its sides are smooth, and entirely destitute of vegetation. The most striking face of the larger Cathedral Rock is turned up the valley, but on the side facing the entrance there is a feature of great beauty—namely, the Bridal Veil Falls, made by the creek of the same name, which, as it enters the valley, descends in a vertical sheet of 630 ft. perpendicular, striking there a pile of débris, down which it rushes in a series of cascades, with a vertical descent of nearly 300 ft. more, the total height of the fall being 900 ft. When the stream is neither too full nor too low, the mass of water in its fall vibrates with the varying pressure of the wind, in a manner to justify the poetic name it now bears. Another fall, the Virgin's Tears, in a recess of the rocks opposite the Bridal Veil, and just below El Capitan, is over 1,000 ft. high.

The walls of the valley continue lofty and broken into the most picturesque forms. Of these the Three Brothers and the Sentinel Rock are the most conspicuous. Nearly opposite the Sentinel Rock is the fall made by Yosemite Creek down the wall on the N. side of the valley. There is first a vertical fall of 1,500 ft., then a descent of 626 ft. in a series of cascades, and finally one plunge of 400 ft. on to a low talus of rocks at the foot of the precipice. At the head of the valley are the two falls of the Merced River, with intervening rapids. The lower one, Vernal Fall, is about 400 ft. high; the upper, the Nevada Fall, about 600 ft.

Dome-shaped masses of granite characterize the vicinity of the Yosemite. The North Dome, on the N. side of the valley, lends itself to beautiful combinations of scenery, as seen from a little above the Yosemite Falls. The Sentinel Dome, on the opposite side, not visible from the valley itself, affords a magnificent view from its summit. A projecting cliff, called Glacier Point, 4,737 ft. high, a little lower than this, and just on the edge of the valley, is also much visited for the sake of the view which it offers of the whole region. The Half Dome fronts the valley of the Tenaya Fork of the Merced with a steep slope, crowned by a vertical wall of 1,600 ft. in elevation.

The Yosemite Valley was given by Congress to the State of California in 1864, to be "held for public use, resort, and recreation," and to be "inalienable for all time." It is managed by commissioners appointed by the governor. Wagon roads into the valley from its lower end and leading up the Merced River have been built by private parties, as were the various excellent trails built to afford access to Glacier Point, Union Point, and other elevations commanding remarkable views.

You'mans, Edward Livingstone, 1821-87; American scientist; b. Coeymans, N. Y.; studied chemistry, physics, and medicine, although, on account of a disease of the eyes which made him blind at times for many years, he could pursue his studies only by the aid of his sister, Eliza Anne Youmans. Besides delivering scientific lectures during a period of fifteen years, he published "A Chemical Chart," "Class Book of Chemistry," "Alcohol and the Constitution of Man," "Chemical Atlas," "Hand Book of Household Science," "Correlation and Conservation of Forces," "The Culture Demanded by Modern Life." In 1871 he founded the *International Scientific Series* (New York, London, Paris, Leipzig, St. Petersburg, and Milan), and, 1872, the *Popular Science Monthly.*

Young, Brigham, 1801-77; Mormon; b. Whitingham, Vt.; son of a farmer; was educated in the Baptist Church, and trained as a painter and glazier, but joined in 1832 the Mormons at Kirtland, Ohio, and started, 1835, on his first missionary journey. He was successful as a preacher, being possessed of a peculiar but very impressive eloquence, and at the same time rose to the highest dignities and acquired an almost boundless influence within the sect by his energy and shrewdness, and by the power of his personality. After the death of Joseph Smith in 1844, he was chosen president of the church, and in 1846 he led the Mormons from Nauvoo to Great Salt Lake valley, where he founded Salt Lake City in 1847. In March, 1849, a convention was held in that city, a constitution was framed, and a state was organized under the name of *Deseret.* Congress refused to admit the new state, and organized the Territory of Utah, Brigham Young being appointed governor. Conflicts soon arose with the Federal Govt., the U. S. officers were expelled from the territory, and, in spite of the forcible measures which the Government took from time to time, Young continued to wield an almost unlimited power. In 1852 he introduced polygamy as an institution, as the celestial law of marriage, and carried it through in spite of considerable resistance from a division of the church. In 1871 he was indicted for polygamy, but was not convicted. Died at Salt Lake City.

Young, Edward, 1684-1765; English poet; b. Upham, Hampshire; educated at Winchester School and at Corpus Christi College, Oxford;

obtained a law fellowship at All Souls' College, Oxford; took there the degree of doctor of laws, 1719; took orders in the Church of England, 1727; was appointed a royal chaplain, 1728; became rector of Welwyn, Hertfordshire, 1730. He published a number of tragedies, "Busiris," "The Revenge," etc.; a collection of satires, "The Love of Fame," and other writings; but is best remembered by his religious blank-verse poem, "Night Thoughts."

Young Men's Chris'tian Associa'tions, societies of young men with a basis of specific Christian principles, working by methods consistent with the same for the physical, social, mental, and spiritual improvement (*a*) of their membership and (*b*) of young men in general.

In 1841 George Williams removed from a provincial town to London, and became a clerk in a large drygoods house. He began a quiet but earnest effort among his companions to lead them into the Christian life. On June 6, 1844, an organization was effected under the name of Young Men's Christian Association, and soon were added the library and reading room, and courses of lectures; a secretary was employed, and branches were formed in Great Britain. The total number of associations in the world is now 7,942.

Although young men's religious societies existed in N. America more than two hundred years ago, the Young Men's Christian Associations are a direct outgrowth from the London movement of 1844. The first American associations were organized in December, 1851, at Montreal and Boston. The first convention met in Buffalo, N. Y., June 7, 1854. Its action resulted in a confederation, with a central committee and an annual convention, this form of affiliation continuing until the Civil War.

The General Work.—The American International Convention is held biennially, every association being entitled to representation on the basis of its active membership. A central board, incorporated as the "international committee," is elected by the convention, one third every two years, its headquarters and a working quorum being located in New York. The committee's executive force includes a general secretary, with twenty-five field, department, and office secretaries. It has also eight secretaries in foreign-mission lands. State and provincial organizations supplement in their several fields the work of the international committee.

The Local Work.—The local association has absolute autonomy, except that to affiliate with the American International Convention there must be constitutional provision restricting active (voting and office bearing) membership to men in communion with an evangelical church. A typical American association may be thus described: (1) Membership: (*a*) Active—Christian young men who constitute the working force; (*b*) Associate—young men of good moral character. (2) An incorporated board of management, officers, and system of committees. (3) A paid secretary, as executive officer, whose chief province is to supervise and develop. (4) A specially constructed building, with reception room, reading room, library, parlor, recreation room, offices, educational classrooms; gymnasium, including bowling alley, baths, and dressing rooms; rooms for boys' department, kitchen, and janitor's quarters. (5) Organized Departments—(*a*) Business: general supervision, membership. (*b*) Religious: Bible and workers' training classes, etc. There is also a world-wide observance of an annual week of prayer in November. (*c*) Educational: library and reading rooms, evening classes in commercial, industrial, scientific, literary, political and social-economic subjects, literary societies, and lectures. (*d*) Physical: gymnasium, athletic games, cycling, boating, swimming, etc. (*e*) Social. (*f*) Information and Relief: employment bureau, boarding-house register, savings fund, medical club, visitation of the sick. (*g*) A work more or less complete along all these lines for boys. The work has broadened out, and now includes work among special classes, *i.e.*, merchants' clerks, etc., among college students, and railway men.

The World's Committee.—The first World's Conference was held in Paris in 1855, at which was adopted: "The Young Men's Christian Associations seek to unite those young men who, regarding Jesus Christ as their God and Savior, according to the Holy Scriptures, desire to be His disciples, in their doctrine and in their life, and to associate their efforts for the extension of His kingdom among young men." In 1878 there was constituted a "central international committee," composed of representatives from all the affiliating national organizations, and with its executive quorum resident in Geneva, Switzerland.

The thirteenth world's conference was held in London in June, 1894, coincident with the fiftieth anniversary of the association of that city, the pioneer organization. Two thousand delegates were present, representing twenty-six nationalities.

Youngs'town, capital of Mahoning Co., Ohio; on the Mahoning River; 67 m. SE. of Cleveland, and the same distance NW. of Pittsburg, Pa. Its principal industry is the manufacture of iron. The site of the present city and township of Youngstown was purchased from the Connecticut Land Company in 1800 by John Young, who settled there in 1799. The first rolling mill (the second in the state) was erected in 1845–46, and the first furnace in 1846. Pop. (1906) abt. 52,710.

Young Wom'en's Chris'tian Associa'tions, organizations devoted to the physical, social, intellectual, and spiritual development of young women. The first of these associations was founded in London, England, in 1855. In the U. S. they were the outgrowth of the Ladies' Christian Union established in New York in 1858. The object of this organization was to further the welfare of women, especially of young women dependent on their own efforts for support. In 1866 a Young Women's Christian Association was founded in Boston—the first association organized under that name. While at first the work of the organizations was modeled on that of the Young Men's

Christian Associations, it was soon found that among women the requirements were more varied. A valuable and important feature of their work is the maintenance of boarding homes for young women. In addition to these, the city associations have gymnasiums, educational classes, entertainments, lectures, employment bureaus, and other means for promoting the intellectual and social interests of their members.

There is also a distinct organization of Young Women's Christian Associations that originated in the colleges. In November, 1872, the first college Young Women's Christian Association was organized in the State Normal University, Normal, Ill.

Yriarte (ē-rē-är'tē), **Charles Émile**, 1832- ; French writer; b. Paris, of a family of Spanish descent; studied architecture, and, 1856, became inspector of the imperial asylums, and, later, of the Opéra at Paris, but went, 1859, as correspondent of the *Monde Illustré* to the Spanish War in Morocco; 1860-61, followed the war in Italy, and, returning to Paris in 1862, he became editor in chief of the journal. In 1871 he resigned this position, and for several years devoted himself to travel and the study of the history of art. In 1881 he was appointed inspector of the École des Beaux Arts. Yriarte's literary works fall into several distinct groups: (1) A series of impressions of war and of society in and out of Paris; (2) a series of studies of life and society in Italy during the Renaissance; (3) several contributions to the history of art; (4) some magnificent illustrated works; and (5) historical sketches. Over his own name and the pseudonyms, Junior, Marquis de Villemar, etc., wrote much for the *Figaro* and other Parisian journals.

Yttrium (ĭt'trĭ-ŭm), so named because first detected in gadolinite found at Ytterby, in Sweden, a rare metal belonging to the cerium group; atomic weight (Cleve) 89.6, or, according to Bunsen and Bahr, 92.5, symbol Y. Cleve prepared the metal by the electrolysis of the double chloride of yttrium and sodium, and also by fusing this salt with sodium. It was thus obtained as a dark-gray powder with a metallic luster under the burnisher. It decomposes cold water slowly and boiling water more quickly. Yttrium oxide (Y_2O_3), or yttria, is obtained as a yellowish-white powder by igniting the oxalate or hydroxide. It is not directly soluble in water, but dissolves slowly in nitric, hydrochloric, and sulphuric acids, forming sweetish salts.

Yttrium occurs as a silicate and as yttria in gadolinite, a mineral with a vitreous luster, usually found in masses of a black or greenish-black color; as a phosphate in xenotime, and as a fluoride in yttrocerite.

Yucatan (yō-kä'tän'), a peninsula of SE. Mexico, projecting N. between the Gulf of Mexico and the Caribbean Sea, and separated from the W. extremity of Cuba by a channel about 140 m. wide. It embraces the two states of Campeachy, occupying about one fourth of the peninsula in the SW., and Yucatan. Area, 53,290 sq. m. Pop. (1900) 400,629. Unlike the main body of Mexico, Yucatan is not mountainous, except in the S. part. There is comparatively little heavy forest, except in the S. mountains or on swampy flats adjoining the coast. Though rains are abundant in their season, many districts are almost without running water, so much of the land is unfitted for ordinary agriculture; but it is well adapted for grazing and for the cultivation of sisal hemp, which is now the staple product and export. The climate is warm and somewhat insalubrious. The civilized population is gathered in the N. part. Merida, the capital, and its seaport, Progreso, are the most important towns. The S. districts are still held by Indians, only nominally subject to the Mexican Govt. Yucatan was the first portion of Mexico visited by the Spaniards, 1517-19. It was crossed by Cortés on his way to Honduras (1525), and was partly conquered by Montejo, 1527-49. The Indian inhabitants of the Maya race had attained a considerable degree of civilization, and their skill in architecture is still shown by the ruined cities of Uxmal, Chichen, etc. They resisted the Spaniards bravely, but eventually the N. tribes were subdued, and their descendants form a large portion of the inhabitants. The Maya language is still in general use in the interior, and is spoken even in Merida. Yucatan was attached to New Spain, or Mexico, and followed its revolutions, more or less willingly, until 1839, when it seceded and formed an independent state. It was reunited to Mexico in 1843. In 1847 the Indian population revolted, holding a large part of the peninsula for several years, and even threatening Merida.

Yucca (yŭk'kȧ), the aboriginal and also the botanical name of a genus of peculiar liliaceous plants, species of which have the English names of bear grass, dagger weed, Spanish bayonet, etc., natives of N. America from New Jersey and from Iowa to Yucatan, but most abundant between the 25th and 35th degrees of N. lat. In *Yucca filamentosa* and some other species delicate threads separate from the edges of the needle-pointed leaf, whence the popular appellation, Adam's needle and thread. The framework of the leaves affords a valuable fiber, which is used for cordage by the Mexicans. The root stocks are replete with mucilaginous and saponaceous matter, which, under the name of "amole," serves as a substitute for soap in many a Mexican household; is also used by the negroes of the S. U. S., and gives the common name of soap plant to *Y. glauca* (*Y. angustifolia* of the books) which abounds between the Mississippi and the Rocky Mountains. The *Y. baccata* of Arizona is eaten when fresh by whites and Indians, and is cured by the latter for winter provisions.

Yu'kon, a district in the NW. part of Canada lying almost entirely in the basin of the Yukon River and bounded by British Columbia on the S., the Arctic Ocean on the N., Alaska on the W., and the district of Mackenzie on the E. Area, land and water, 196,976 sq. m.; pop. (1901) 27,219. The region is wooded and more or less mountainous, rising near the Alaska boundary line to Mt. Hubbard, about 18,000 ft.; vegetables and cereals are successfully grown, but the chief resource thus far is gold, which is mined in the famous Klondike region. Fort Selkirk is the important military post, and Dawson, near the site of old Fort Reliance, is the principal city.

Yukon Riv'er, one of the great rivers of the world. In N. America it is second in drainage area and in volume. Its length is about 2,000 m., and its hydrographic basin approximately 440,000 sq. m.

The position of its source is not yet definitely determined; it is a muddy stream, and is building an immense delta where it enters Bering Sea. This is treeless, and forms a part of the tundra along the coast of Bering Sea and the Arctic Ocean.

The season of navigation is usually from the middle of June to the middle of October. In winter it is solidly frozen; in spring thawing begins, and great floods occur. The Yukon is a highway of travel for the natives. The Eskimos use skin boats, kyaks, and the Indians birch-bark canoes. In winter long journeys are made on sleds drawn by dog teams.

Gold is found in the river gravels of the upper Yukon. The center of this industry is now on Forty-mile Creek, just within the E. boundary of Alaska. The gold is obtained by washing the gravel in sluices.

Z

Z, the twenty-sixth letter of the English alphabet. It has the form of the final letter of the Roman alphabet, which was simply the Greek *zēta*. The older Latin alphabet of twenty-one letters had no symbol for the sibilant *z*.

The sounds expressed by it are: (1) The voiced dental sibilant *z* in *zone, zephyr, mazy*. The same sound is frequently expressed by *s*, as in *lose, nose, reason*. (2) The voiced dental wide sibilant *zh* (*ž*) in *azure, seizure*, a sound correlative to the voiceless *sh* (*š*) of *sugar, sure, censure*. The sound *zh* is frequently expressed also by *s*, as in *pleasure, leisure*.

Z was little used in English before the fifteenth century.

Za'baism. See SABIANISM.

Zacatecas (zăk-ă-tă'kăs), a state of Mexico. See MEXICO.

Zacatecas, city of Mexico; capital of the State of Zacatecas; in a high valley between spurs of the Sierra Madre; over 8,000 ft. above sea level; 439 m. by the Mexican Central Railroad NW. of Mexico City. It was founded as a mining town abt. 1548; its silver lodes were the most famous in New Spain. The climate is cold and subject to sudden changes, though not insalubrious; the water supply is scanty and poor, and the narrow valley leaves so little room for growth that many of the streets climb the mountain sides like staircases. Carriages are almost unknown. The city is picturesque, resembling a Moorish town. It has a cathedral (commenced 1612, completed 1752) noted for its quaint carvings. On the Bufa hill near the city is a celebrated chapel and resort of pilgrims; and at Guadalupe, 6 m. off, is one of the most beautiful chapels in Mexico, with a handsome park. Pop. of Zacatecas (1900) 32,856.

Zacynthus (ză-sĭn'thŭs). See ZANTE.

Za'dok. See SADDUCEES.

Zambesi (zăm-bā'zė), the fourth river in size in Africa, discovered by Livingstone in 1854. Its most W. head waters rise a little E. of Benguela, Portuguese W. Africa, and the Zambesi proper flows S. and E. two thirds of the way across the continent, emptying into the Indian Ocean by a widespreading delta. The country it drains is one fifth as large as the U. S., exclusive of Alaska. From its sources nearly to its mouth it passes through one of the largest pastoral regions of Africa. Steamboats are superseding the small trading canoes formerly in use, and the town of Chinde has been built in the delta as the port of the river. Above the delta there are 600 m. of steam navigation on the Zambesi and its N. tributary, the Loangwa, interrupted by one stretch of 30 m. of land portage around cataracts. Coal has been discovered near the N. bank of the middle Zambesi, and promising gold fields N. of the river and within easy reach of it. On the upper Zambesi are the famous Victoria Falls. The total length of the river is between 1,500 and 1,600 m.

Zanes'ville, capital of Muskingum Co., Ohio; on the Muskingum River, where it receives the waters of the Licking; 59 m. E. of Columbus. It is in a fertile country, on the edge of the great mineral region of Ohio, and possesses water power from the falls of the two rivers. Surrounded as the city is with high hills, there is little room for parks. The two most worthy of mention are the Putnam and the McIntire. The manufacturing interests include ironworks, tiling works (encaustic and mosaic), potteries, foundry and machine shops, glass works, brick works, planing mills, flouring mills, breweries, tanneries, marble works, and the large railway car shops, etc.

The original town was laid out in 1799 by Jonathan Zane and John McIntire, Virginians. They owned a section a mile square, and platted the lots in the SE. corner and called it Westbourn, a small part of the present city. The first regular mail carried in Ohio was from Marietta to Westbourn. In 1802 Postmaster-general Gideon Granger established a regular post office here and called it Zanesville, whence the town took its name, but it was not incorporated until 1814. From 1810–12 Zanesville was the state capital. Pop. (1906) est. at 24,856.

Zanguebar (zăn-gā-băr'). See ZANZIBAR.

Zante (zăn'tā), anciently, *Zacynthus*, island; one of the largest of the Ionian group; area, 277 sq. m. It is of volcanic origin, and earthquakes are frequent. The climate is delightful and the soil fertile. The island produces currants, citrons, oranges, pomegranates, melons, olives, and wine, of superior quality; carpets, linen and cotton goods, and gold ornaments are made. In the village of Kery are naphtha wells, worked since antiquity. Zante, the capital, is a finely situated and enterprising town. It has a good, though not deep, harbor, and carries on a large trade. Pop. (1907), of island, 42,502; of town, 13,580.

Zanzibar (zăn'zĭ-băr), or **Zanguebar'**, a sultanate of E. Africa under British protection. It formerly consisted of coast islands and possessions on the mainland that were acquired by Imams of Muscat from the Portuguese and from native chiefs between 1698 and 1807. The sultans of Zanzibar, direct descendants of the Imams of Muscat, were until recently the paramount influence from the coast to the upper Kongo. Zanzibar has been independent of Muscat since 1861.

The largest island and center of trade of the sultanate is Zanzibar (area, 640 sq. m.). Other important islands are Pemba, Mafia, and Lamu, the total extent of the islands pertaining to the sultanate being about 1,200 sq. m. Until 1890 about 12,000 sq. m. of coast regions were under the direct government of the sultan, though in 1884–90 the Germans and British acquired inland territories extending to the large lakes among numerous tribes who had not actually come under the sultan's authority. The sultan at first leased to these two powers a long coast strip, but later they acquired this territory in perpetuity, and finally Great Britain assumed a protectorate over Zanzibar (1890), and the independent state created by the Muscat Arabs has ceased to exist. The island of Zanzibar had (1907) abt. 176,000, of whom abt. 80,000 lived at the capital, including 10,000 Arabs and 5,000 E. Indians, the remainder being an admixture of coast and inland tribes. The Arabs, who are the ruling element throughout the sultanate, are almost exclusively tradespeople, except W. of Lake Tanganyika, where they made large plantations. They established large interior towns—Tabora, Ujiji, Nyangwe, Kassongo, and others—and often remain for a long time or permanently in the interior. The capital for their enterprises is largely supplied by the Indian merchants of Zanzibar and the coast towns, who receive an exorbitant rate of interest and contrive to keep the Arabs in their debt.

The capital city, Zanzibar, is by far the largest center of trade in E. Africa, and has been the starting point of many of the most famous exploring expeditions. It was once the greatest slave market, and is still the largest export ivory market in the world. Most of the interior trade routes lead to Zanzibar or to a half dozen coast towns, N. and S., that are directly tributary to it, and send their exports there for shipment. The city was declared a free port in 1892. It is visited by about three merchant steamships a week. Pop. (1907) abt. 55,750. Pemba is famous for cloves. The most important coast towns are Mombasa, now in the British domain, and Kilwa, Bagamoyo, Pangani, Saadani, Dar es Salaam, Lindi, Tanga, and Malindi, all in German E. Africa. See GERMAN E. AFRICA.

Zarathushtra (ză-ră-thōsh'tră). See ZOROASTER.

Zea'land, Dutch province. Also a Danish island (Själland). See SEELAND.

Zealots (zĕl'ŭts), a fanatical Jewish sect which struggled against the Romans from abt. 6 A.D., when Judas the Gaulonite headed a revolt, till the fall of Jerusalem, 70 A.D. Beginning as intense Jews, they became robbers and murderers of their political opponents, and after Felix had cruelly endeavored to suppress them by crucifying all he could catch, they armed themselves with short daggers (*sicæ*) and continued their murderous work on a larger scale. Hence they are known as the Sicarii. They kept alive the hatred of the Romans, which flamed out in the Jewish War, and they contributed much to the horrors of the siege of Jerusalem.

Ze'bra, any one of the striped wild asses of Africa, but more particularly the mountain or true zebra, found in the mountainous regions of S. Africa, and in danger of extermination. It is about 4 ft. high at the shoulders, of a creamy white color, cross-striped with black on the head, trunk, and legs, except on the belly and inside of thighs; the tail is tufted and blackish at the end. A closely related species occurs in NE. Africa. Burchell's zebra is a commoner animal, occupying the central regions of Africa, readily distinguished from the true zebra by its larger size and the absence or faintness of the cross stripes on the lower part of the legs. It is known as dauw by the Dutch colonists. The quagga has no bands on the hinder portion of the body nor on the legs. The name quagga is also employed for Burchell's zebra. Although so conspicuously marked, the zebra is said to readily escape detection when lying down, as the stripes of the legs then blend with those of the body, the general effect being that of flecks of shadow on a light ground. Zebras are very wild and untamable, although occasionally broken to harness.

Zebra Wolf. See TASMANIAN WOLF.

Zebu (zē'bū), book name for the common ox of India, found also in China and E. Africa, the name not being used in India. It differs from the common ox of Europe and America in having one, or more nearly two, humps of fat on the shoulders, and in having eighteen vertebræ in the tail, while our cattle have twenty-one. The Brahman cow goes with young three hundred days, the common cow two hundred and seventy. Hence the zebu is assigned to another species. Nevertheless it breeds freely with common cattle. The zebu is of several breeds, varying in size. The beef is of fair quality, and the hump is prized. Zebus are trained to draw carriages, to plow, and to serve as beasts of burden. To this stock belong the Brahminy or sacred bulls of Shiva.

ZEBU.

Zeb'ulon, the tenth of the twelve sons of Jacob, the sixth and last by Leah. His personal history is a blank. In the exodus from Egypt the tribe of Zebulon marched in the van, next after Judah and Issachar, just ahead of the six wagons which carried the hangings, planks, and pillars of the tabernacle. The territory of the tribe in Palestine was bounded on the E. by the half of the Lake of Galilee, beginning just above the site of Tiberias, and included Nazareth and Rimmon, but especially the fertile plain of Buttauf, on whose N. edge stood Cana of Galilee (Josh. xix, 10–16). It disobeyed the divine command and did not drive the Philistines from its territory, but brought them under tribute (Jud. i, 30). It answered the rallying cry of Gideon (Judges vi, 35), and joined in the crowning of King David (1 Chron. xii, 33, 40). It ceased to exist as a tribe when Tiglath-Pileser carried it into captivity (2 Kings xv, 29). But in its territory Jesus preached the most of the time (Matt. iv, 12–16), fulfilling Isaiah ix, 1, 2.

Zechariah, or **Zachariah** (zĕk-ā-rī'ā), the eleventh of the twelve minor prophets. He returned from Babylon with Zerubbabel, and began to prophesy in the second year of Darius, King of Persia, 520 B.C., two months after Haggai. He was author of that book of the Old Testament which is called by his name, the longest of the "minor prophets." His style is broken and unconnected.

As to his personal history, we only know that he was active, along with Haggai, in encouraging the leaders of the Jews in the work of temple building (Ezra v, 1, vi, 14). Perhaps we should infer from Matthew xxiii, 35, Luke xi, 51, that he met later a tragic death at the hands of the people to whom he prophesied.

Zemstvo (zĕmst'vō), an elective assembly of a province or district in Russia, composed of representatives chosen by the peasants, the householders of the towns, and the landed proprietors, and presided over by the president of the local nobility. It imposes local taxes, regulates education, public health, roads, etc. See DOUMA.

Zenana (zē-nä'nä), that portion of the house of a high-caste family of India which is devoted entirely to the use of the women and girls. Like the portion which belongs to the gentlemen, the zenana, or inner portion, is in the shape of a hollow square, with an open court in the center—the men's building toward the street, the women's back of it. No woman goes to the outer part of the building, as it is considered a disgrace for her to be seen by any man but her own husband.

Zend-Aves'ta. See AVESTA.

Ze'nith, the point in the celestial sphere directly over the head of the observer; the opposite of the *nadir*.

Ze'no, abt. 358 B.C.–abt. 260; Greek philosopher; founder of the Stoic school; b. Cyprus. He was a merchant, but having lost a rich cargo, devoted himself to philosophy. Abt. 310 he opened his school in Athens, which took its name from being held under the *Stoa Poikilé*, or painted porch. He was at its head for half a century, respected for the austerity of his life and the boldness of his language. Of his writings only a few fragments remain.

Zeno of E'lea, Greek philosopher; b. Elea, S. Italy, abt. 490 B.C. He was put to death for engaging in a conspiracy against a tyrant of Elea. He was the first of his school to write in prose, and Aristotle calls him the inventor of dialectics.

Zeno'bia, Queen of Palmyra. The daughter of a Syrian chieftain, she married Odenathus, who from a private station became Prince of Palmyra, and virtual master of the East, and who, because of his brilliant campaigns against the Persians, was declared augustus and coregent of the empire by Gallienus. In 267 Odenathus was murdered by his nephew Mæonius. Thereupon Zenobia assumed the title of Queen of the East, asserted her independence of Rome, defeated the Roman general Heraclianus, and extended her authority over Syria, parts of Asia Minor, Mesopotamia, and Egypt. Aurelian marched against her in 272. He won the two battles of Antioch and Emesa, where she commanded in person, and then besieged Palmyra, which she defended with desperation. Finally, Zenobia fled to seek assistance of the Persians, but was captured on the Euphrates. Her later history is obscure. The commonly received account represents her as a captive, laden with jewels and silver chains, and walking before Aurelian's chariot on his triumphal entry into Rome in 273; then as living as a Roman matron in a villa near Tibur, and marrying her daughters to Roman patricians. Another account says that she starved herself to death after her capture. Zenobia was a woman of extraordinary beauty and accomplishments. She spoke Greek, Latin, Syriac, and Coptic. She was brave and wise in battle, judicious in the council chamber, and economical and shrewd in administration. She is perhaps the only woman in the East "whose superior genius broke through the servile indolence imposed on her sex by the climate and manners of Asia."

Zephaniah (zĕf-ȧ-nī'ȧ), the ninth in order of the minor Hebrew prophets; was great-great-grandson to Hezekiah, perhaps the king of that name, and prophesied under Josiah, 638–608 B.C. (Zeph. i, 1). The book of the Old Testament, called by his name, is, like Joel and Obadiah, a monograph on "the day of Jehovah" (i, 7-11, 14–18; iii, 8, 11, 16, 19, 20), containing a threat of judgment (i), an exhortation to repentance (ii, 1-iii, 8), and a promise of salvation (iii, 9–20). It probably belongs to the early reign of Josiah, after the partial reformation of the later years of Manasseh.

Zeram (sȧ-rän'). See CERAM.

Ze'ro, in physics, the point in space or time which serves as the origin or base of measurements. Thus upon a linear scale there is always a zero reading from which the count is made. It follows that the zero is always arbitrary and relative, although in some cases it takes on a semblance of absolute character. An example is the so-called *absolute scale* of temperature, which is defined as follows: Suppose a cylinder to contain a perfect gas. If the volumes of the gas at the temperatures of melting ice and of boiling water respectively be noted and the same be indicated by lines upon the cylinder at proper distances from the closed end, and if the intervening space be divided into one hundred parts, each of these will be a degree of the centigrade scale. The division may, however, be carried downward, in which case it will be found that the 273d division below that corresponding to the ice point coincides with the bottom of the cylinder. The point — 273° C. is therefore called the *absolute zero*. Familiar examples of purely arbitrary zeros are that of the Fahrenheit thermometer, the various meridians from which longitude is counted, the zero of the daily counting of time, etc. The most important consideration is that the zero should be capable of definition in a simple and unmistakable manner.

Zeus (zūs). See JUPITER.

Zeuxis (zūks'ĭs), Greek painter, of whom many anecdotes are told by Lucian and Cicero, and especially by Pliny. His birthplace is stated as Heraclea, but which city of that name is not known. The date of his birth is uncertain; it is only known that he was painting and already famous in 424 B.C., and very probable that his career was in the years 450–400 or thereabout. There is no painter of antiquity of whom more or stronger anecdotes are told, but a real knowledge of what his art was like is not possible to moderns.

Zhitomeer (zhĭt-ō-mēr'). See JITOMIR.

Zinc, sometimes called SPELTER, metallic element abundantly distributed. Since it must be procured by a process of distillation, it was not known in metallic form to the ancients, though they knew how to make alloys of it with copper (making brass) by adding zinc ores to melted copper. It was first brought from the East, and it is not much more than one hundred years since zinc was first smelted in Europe. There are only six mineral species which furnish all the zinc and zinc white of commerce. These are blende, calamine, willemite, smithsonite, franklinite, and zinkite, including sulphide, silicates, carbonate, and oxide. The ores are first roasted, then distilled with carbon. Most commercial zinc, when required pure, must be redistilled.

The metal zinc is very hard, with a bluish color, and a brilliant luster when freshly cut. It soon takes a tarnish, however, from the formation of a film of suboxide or carbonate, which protects it from further oxidation, so that it is an extremely durable metal. When cast, it is crystalline and brittle; but by heating to somewhat below 300° F. it may be rolled into very thin malleable plates. The best way to obtain it pure is by electrolysis. At a little higher temperature a very brittle and fragile modification appears, and in a mortar heated to 400° F. the metal may be crushed to powder. It melts at about 780° F., and boils at about 1900° F. When chemically pure it dissolves readily in nitric acid, but not in dilute sulphuric and hydrochloric. Even ordinary commercial zinc, containing lead, iron, etc., may be protected from the latter two acids by the thinnest film of mercury, which in voltaic batteries is used for this purpose. On contact, however, with most other metals, and other substances capable of conducting electricity, the zinc dissolves, hydrogen being evolved from the surface of the other metal. Hence, through the formation of voltaic circuits with its metallic impurities, commercial zinc is readily soluble in acids, and even in solutions of neutral salts. Zinc is largely used as a protective coating for iron and copper. Zinc dissolves also in alkalies.

Almost all the other common metals, except lead and bismuth, alloy readily with zinc. Under BRASS will be found some mention of the important alloys with copper. With lead, zinc will not unite unless through intermediation of some other metal, such as tin, which alloys with both; with lead and bismuth also, a fusible alloy is obtained which melts in boiling water. Bronze, which properly consists of tin and copper, is often alloyed with zinc, and triple alloys of these three metals are used for journal boxes and other purposes. An alloy with eleven times its weight of tin is beaten into leaves and used as a substitute for silver leaf.

Zinc forms a number of compounds which are useful in the arts. For the oxide, see ZINC WHITE. The sulphide of zinc is found constituting two mineral species, blende or sphalerite, and wurtzite. Hydrous silicate of zinc occurs as calamine. It is used as a pigment for producing a brilliant green in glazed pottery.

Zinc vitriol, white vitriol, or zinc sulphate is a familiar commercial compound, also occurring in nature as goslarite. It is prepared by roasting and then washing out blende, or by dissolving metallic zinc in dilute sulphuric acid, and crystallizing. White vitriol has an acrid, metallic taste, and is used in medicine as an emetic.

ZINC CHLORIDE, BUTTER OF ZINC.—Zinc combines powerfully with chloride, thin foil taking fire therein spontaneously. The aqueous solution of the substance thus formed, zinc chloride, has several uses in the arts. It is used for "burnettizing" wood and as a disinfecting agent.

Zincog'raphy, the art of producing impressions of prints and other designs on zinc, from which a facsimile on paper can be made. It is analogous to lithography; the term is applied to the processes of *anastatic printing* (*anastasis*, resuscitation), *zinc printing*, *paniconography*, and *photozincography*. In *anastatic* printing, first used in Germany in 1840, a printed sheet is moistened with water containing nitric acid, which affects only the parts where there is no printing, being repelled from the letters by virtue of the oily matter in them. The sheet is then pressed on a prepared zinc plate, whereby a typographical surface is produced, from which impressions can be printed on paper. *Zinc printing* consists in first etching designs in the metal with the needle, cleaning them with acid, and covering the entire plate with a layer of fusible metal, which is afterwards removed by planing until the etched lines appear at the surface; the plate is then dipped in an acid bath, when the surface of the plate will be dissolved, but not the fusible metal which fills the lines; in this way a relief drawing, suitable for the printing of maps, plans, etc., can be obtained.

In the process of *paniconography*, crayon drawings, proofs of wood or copper plates, etc., are transferred to a zinc plate, a damp inked roller is passed over it to deepen the impression, and powdered rosin then spread on it, which adheres only to the parts that were moistened by the ink. Upon now placing the plate in a bath consisting of diluted nitric acid, the unprotected surface is etched, and a relief surface formed which can be used for printing. *Photozincography* is accomplished by first preparing a photograph, then transferring it to zinc, from which copies can be multiplied as from a lithographic stone; it is based upon the fact that bichromates render gelatin insoluble when a mixture of the two is exposed to the action of light. The paper used is prepared with a solution of bichromate of potassium and gelatin, and exposed together with the negative of a drawing or other design to the light, the outline of the same being thus obtained in insoluble lines. On then covering it with printer's ink and wetting it at the back, the soluble portion swells up, and allows of the removal of the ink from this part, but not from the insoluble lines. A copy of the object photographed is thus produced in ink, which can be easily transferred to zinc. See PHOTOENGRAVING.

Zinc White, a commercial product used largely as a pigment, formerly made by the combustion of metallic zinc and collection of the fumes, but of late years obtained directly from zinc ores by a process which combines the reduction of the zinc from the ore to a metallic vapor, and the subsequent burning of this vapor in the same apparatus. Zinc white is extensively used as a substitute for white lead in painting woodwork.

Zinzendorf (tsĭn'tsĕn-dŏrf), **Nicholas Lewis von** (Count), 1700–60; leader of the Moravians; b. Dresden. He attended the Pedagogium at Halle, 1710–16, and against his own inclinations was a law student at Wittenberg, 1716–19. Whithersoever he went he found himself more interested in religious than in the higher social circles that were open to him; 1721–27, he occupied a civil office in compliance with the ambitious projects of his relatives. In 1722 he settled a colony of Moravian refugees on the Berthelsdorf estate in Lusatia, which he had purchased. This colony (Herrnhut) became a center of attraction. This interest growing, in 1727 he fully identified himself with it, and became the great organizer of the Moravian Church. Zinzendorf's original conception was not that of a separate denomination, but a union of all the followers of Christ and advocates of a religion of the heart within the bounds of the various confessions. Hence he continued to claim his loyalty to the unaltered Augsburg Confession and Luther's Catechism, and to affirm that he still remained a Lutheran. Ordained a minister at Tübingen in 1734, he was consecrated a bishop in 1737. Banished from Saxony in 1736, he lived in Germany, Holland, England, St. Thomas, Pennsylvania, again in England, various parts of Germany, and in Silesia, everywhere preaching the Gospel. While in Pennsylvania (1741–42) his work was around Bethlehem and Germantown as centers. He pressed forward missionary activity among the N. American Indians; he acted as pastor of the Lutheran Church in Philadelphia, and used the title of inspector general. The sentence of banishment being removed in 1749, he returned to Herrnhut, where he died. His chief claim to literary recognition rests upon his 2,000 hymns, a number of which are in use in English translations of John Wesley and others.

Zi'on, or **Sion**, an eminence in Palestine, on which a part of Jerusalem is built. It rises 2,540 ft. above sea level. W. and S. it faces the valley of Hinnom with a steep precipice 300 ft. high. On the N. slope stands that part of Jerusalem called the "city of David" or the "upper city"; hence Jerusalem was often called the "daughter of Zion." See JERUSALEM.

Zi'onism, a movement instigated by Dr. Herzl (d. 1904) of Vienna to purchase Palestine for the formation of an independent Jewish nation. Through the assistance of Baron de Hirsch and the Rothschilds many Jewish colonies have been planted in Palestine. The first Zionist Congress met at Basle, Switzerland, in 1897, and others have followed, attended by delegates from all parts of the world. The flag of Zion is composed of blue stripes on a white field, with a six-pointed star in the center. See JEWS.

Zircon (zẽr'kŏn), a silicate of zirconium, occurring in crystals, generally four-sided prisms terminated by four-sided pyramids, and also in grains of a white, red, brown, yellow, green, or reddish-orange color, the last being sometimes called hyacinth or jacinth. It is found in the sands of rivers of Ceylon, in the sienite of Norway, at Strontian in Argyleshire, Scotland, and in streams of the Croghan Kinshela Mountains in Ireland.

Zis'ka, John, 1360–1424; leader of the Hussites; b. Trocznow, Bohemia; educated at the court of Prague, and fought with the Teutonic knights against the Lithuanians and Poles, in Hungary against the Turks, and on the English side in the wars between England and France; embraced the doctrines of Huss, and was conspicuous in the commotion caused by the execution of Huss and Jerome. He was present on the famous July 30, 1419, when the thirteen Roman Catholic magistrates of Prague were thrown out of the windows and massacred. Under the leadership of Ziska the Hussites formed a camp on Mt. Tabor. They were in possession of Prague, though not of the castle, and in order to defend it against the Emperor Sigismund, who had an army of 30,000 men, Ziska took up a position just outside the city. He had only 4,000 men, but the emperor was unable to remove the Hussites, and had to retire with an immense loss. The hill has since that day borne the name of Ziska Hill. The same year he conquered the castle of Prague, and in the next year became blind, but continued to command. In 1422 the emperor returned with another great army, and a battle took place at Deutsch-Brod. The emperor was completely routed, and now began to negotiate. He was willing to grant liberty of conscience, to make Ziska governor of Bohemia, etc.; but before the negotiations could be brought to a close Ziska died at Przibislaw. He was buried at Czaslau, but in 1623 his tomb was disturbed and his bones removed on an imperial order from Vienna.

Zither (zĭth'ĕr), an instrument of ancient origin; in its primitive form supposed to be identical with the *psaltery* of the Bible, and known among the Greeks as the *kithara.* In its modern shape it consists of a shallow box, upon which are strung some thirty strings. These are technically divided into five melody strings, twelve accompaniment strings, and thirteen bass strings. The two A strings are of steel, the D of brass, the G of steel wound with silver wire, the C of brass with copper wire. The other strings are partly of gut and partly of silk wound with silver wire, and are placed beside these over a lower crosspiece of wood called the tailpiece. In playing the zither the thumbs of both hands are used, also the first, second, and third fingers. The thumb of the right hand is provided with a partially opened ring with which to strike the melody strings. The real home of the zither seems to be Austria and the Tyrol, where it is a national instrument.

Zo'diac, an imaginary zone or belt in the heavens, comprising that region of the heavens within which the apparent motions of the sun, moon, and all the greater planets are confined. It is divided into twelve equal parts, called "signs," which are designated by the names of the constellations Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces, which are supposed to have been invented in Egypt, and refer to the division of the seasons and the agriculture of that country. See CONSTELLATION.

Zodi'acal Light, a faint illumination of the sky in the region of the zodiac visible in the evenings of winter and spring after the end of twilight, and in summer and autumn before daybreak in the morning. It can be well seen only when the sky is perfectly clear, and the moon below the horizon. When seen in the evening it appears as a faint column of light, rising from the W. and inclining toward the S., which can sometimes be traced nearly to the meridian. Atmospheric vapors obscure the view of it near the horizon; it attains its greatest visible breadth and brilliancy at an elevation of perhaps 15° or 20°, where it may be as bright as the Milky Way. It differs from the Milky Way, however, in its extremely soft appearance. Under a very clear atmosphere, near the equator, it may sometimes be seen by keen eyes as an arch of light extending all the way across the heavens, near the ecliptic. Connected with this light is said to be the mysterious phenomenon known as the *Gegenschein,* consisting in a faint glow at that point of the heavens which is directly opposite the sun.

No complete and satisfactory explanation of the zodiacal light has yet been given. The best opinion is that it is caused by a mass of nebulous gases, or finely divided matter, surrounding the sun near the plane of the ecliptic, and extending out a little beyond the earth's orbit. The general aspect of the light shows that its form must be somewhat that of a lens, having the sun in its center. If this view be correct, the illumination is due to reflected sunlight.

Zo'etrope. See MOVING PICTURES.

Zola (zō'lä), **Edouard Charles Antoine Emile,** 1840–1902; French novelist; b. Paris; passed his youth in S. France, but finished his studies at Paris at the Lycée Saint-Louis; became a publisher's clerk. He showed his talent in the "Contes à Ninon," "La Confession de Claude," "Thérèse Raquin," and "Madeleine Férat," which exhibit a violent realism marked by a materialistic conception of life, the prominence of the physiological element, the choice of vice and disease as objects of observation, and a brutal frankness, and often a great power of statement. This realism, which he called naturalism, he defended in critical articles collected in the volumes "Mes Haines," "Le Roman expérimental," "Les Romanciers naturalistes," etc. It was exemplified especially in twenty novels under the general title "Les Rougon-Macquart, histoire naturelle et sociale d'une famille sous le second Empire" (1871–93). Some of these novels have enjoyed a very wide sale and popularity: "L'Assommoir," "Nana," "Pot-Bouille," "Germinal," "La Terre," "La Débâcle" (1892). Afterwards he published "Lourdes," "Rome," "Paris," and "Fécondité," "Travail," "Justice," and "Vérité," the last left incomplete at his death. In 1898 Zola was tried on a charge of defamation, in connection with the Dreyfus case. He fled to England, where he remained till the retrial of Dreyfus. He died from accidental asphyxiation.

Zollverein (tsŏl'fĕ-rīn), a union of the German states, according to which all customs duties along the internal frontiers of the states belonging to the union were abolished, and the revenues proceeding from the customs duties levied along the external frontiers of the union were partitioned among the members according to population. Prussia was the first to propose such a customs union, but at first only the minor states would enter it. By 1834 eighteen states had become members, and others joined from time to time till in the period from 1854 to 1865 nearly all states had entered it. It proved eminently beneficial by throwing down vexatious and mischievous barriers to communication, and by reducing the cost of collecting the revenues. Upon the formation of the German Empire in 1871 there was no longer any reason for the separate existence of the Zollverein.

Zones, the five great divisions of the earth bounded by circles parallel to the equator, and named from the temperature prevailing in each. The torrid zone extends from 23½° N. (tropic of Cancer) to 23½° S. (tropic of Capricorn) of the equator. The N. and S. temperate zones lie between the tropics and the parallels of 66½° N. and S. respectively; the two frigid zones lie between the polar circles and the N. and S. poles. See CLIMATE; EQUATOR; TROPICS.

Zoölog'ical Gar'den, a park containing animals on exhibition. The name is usually applied to the larger institutions, and is often popularly abbreviated to "zoo" in England and America. The first in the Jardin des Plantes, in Paris, was established in 1804, and such menageries are now publicly maintained in most of the world's large cities. Very few publish statistics annually, and the figures shown below are drawn chiefly from a report by Dr. Gustave Loisel, of Paris, to the French Govt. in 1907:

Institution.	Mammals.	Birds.	Reptiles and Amphibians.	Total.
New York Zoölogical Park	607	2,350	897	4,034
Berlin	946	2,176	27	3,149
London	873	1,621	478	2,972
Philadelphia	487	952	1,087	2,526
Hamburg	473	1,665	251	2,389
Schönbrunn	593	1,351	171	2,085
Cologne	424	1,479	98	2,001
Breslau	592	1,067	184	1,843
Frankfort	644	1,002	158	1,804

A census of the New York park in July, 1909, gave the following result:

Mammals	246	species	743	specimens
Birds	644	"	2,816	"
Reptiles	256	"	1,969	"
Total	1,146	"	5,530	"

Other large European gardens are in Antwerp, Amsterdam, Vienna, Copenhagen, Dresden, Hanover, and Rotterdam, and, on other continents, in Calcutta, Cairo, Melbourne, Tokyo, Buenos Ayres, and Rio de Janeiro. In this country, besides the New York and Philadelphia parks, there are gardens at Cincinnati and Washington and smaller menageries in public parks in about twenty other cities. Germany leads in the number, size, and quality of her gardens, although, as seen above, the New York institution is now the largest in the world. Most zoölogical gardens are owned by zoölogical societies, semiprivate corporations with more or less close connection with the municipality. Abroad it is common for them to admit free only members of the controlling societies, charging others a small fee. In New York the Zoölogical Society, by contract with the city, admits the public free on all days of the week except two in return for municipal aid and support, including the use of a large tract of land in Bronx Park. The National Zoölogical Park in Washington is operated by the Smithsonian Institution, and is supported by the Government. Most of the smaller collections are maintained by cities as amusement features of their public parks.

Although the idea of entertainment is prominent in all zoölogical gardens, the larger ones are conducted as serious scientific institutions; and although the larger part by far of the visitors doubtless go to them for entertainment or to satisfy curiosity, they obtain incidentally much valuable information. A well-equipped modern zoölogical garden is, in effect, a museum of living animals, with proper descriptive labels, maintained so far as possible in conditions similar to those of their life in the natural or wild state. Thus, while the older and smaller menageries keep all their animals in cramped cages, the large gardens have buffalo runs, beaver pools, deer ranges, etc., only the dangerous beasts being kept in confinement. The tropical creatures are of course housed, at least during cold weather, in properly warmed buildings.

Zoölogy, the science of animal life, treating of their structure, development, classification, distribution, habits, and derivation. It is now generally reckoned a department of biology. The division relating to extinct animals known only from their fossil remains is usually considered a distinct science—that of Paleontology.

History.—The first writer on zoölogy was Aristotle (384–322 B.C.), who treated it chiefly anatomically. Pliny (23–79 A.D.) wrote interestingly but uncritically about animals and their habits. Little was written on the subject in the Middle Ages. Arabian naturalists introduced Aristotle to the W. world, and Albertus Magnus (1193–1280) wrote a commentary, but neither advanced the science.

Modern zoölogy dates from A. Gesner's "Historia Animalium," published early in the sixteenth century. This and the works of other so-called "encyclopedists" (1500–1750) confined themselves to the statement of facts and prepared the way for the so-called Linnæan period (1750–1800), during which these facts were arranged in a system. Linnæus (1707-78) constructed the first system of this kind—superficial but complete. The "binary" plan of nomenclature which he introduced required that every creature should be assigned to a definite species and genus, and should be named from them. Thus *Felis* is a genus including numerous related members of what we now call the cat family (*Felidæ*). The domestic cat is a species of this genus (*Felis domestica*). The necessity of examining every creature carefully for generic and specific peculiarities led to detailed study and increasing knowledge. Linnæus developed for the first time the idea of an "animal kingdom," and for the next half century his followers, among whom were Buffon, Bonnet, O. F. Müller, Spallanzani, and C. F. Wolff, were engaged in applying the principles laid down in his "Systema Naturæ."

The Linnæan system was deficient, however, in the broader classification. With the Linnæans a species was too definite an entity and the system a rigid structure into which new facts, as they came to light, were to be forced to fit. With the development of the science of comparative anatomy began the Cuvierian period (1800-60). George Cuvier (1769-1832) first established three important principles of the science: the correlation of parts, the subordination of characters, and the idea of types of structure. The first states the law that from the presence of certain characters in an organism the existence of certain others may be inferred—an important principle in paleontology of which Cuvier was the father. The second states that certain characters are subordinate to others, and the third develops from this the idea that animals may be arranged in great types or branches according to their leading characters. Cuvier's types were four—the vertebrates, articulates, mollusks, and radiates. Linnæus had taught that all animal forms were arranged in a continuous series, and this division into types was vigorously opposed, especially by St. Hilaire; but it dominated the zoölogy of the next half century, during which students were occupied in enlarging and developing Cuvier's ideas. With them new branches of the science sprang up or were expanded, such as embryology, histology, and comparative anatomy. The great names of this period are Johannes Müller, Ehrenberg, Leuckart, Richard Owen, and, in America, James D. Dana.

The publication of Charles Darwin's "Origin of Species," in 1859, opened another era, during which the discussion of classification gave place to that of origins. (See EVOLUTION.) The development of organisms had been discussed for some time, and in the hands of Lamarck it had assumed a systematic form, being ascribed largely to modification under the influence of environment, with formation of inheritable variations. Darwin first introduced the idea of natural selection by the survival of the fittest, which has had a powerful influence on all subsequent thought. The idea of descent has given a point from which all branches of the science may be viewed, and all have progressed together with great rapidity. Modern zoölogists may be roughly divided into two schools—the Neodarwinians and the Neolamarckians; the former denying and the latter asserting that acquired characteristics may be inherited. Among the most eminent of the former is Alfred Russell Wallace, who enunciated the principle of natural selection almost at the same time as Darwin, and among the latter was E. D. Cope, the American zoölogist.

Classification.—The number of species of animals recognized by Linnæus was about 6,000. In 1830 it was estimated at 50,000 and in 1860 (by St. Hilaire) at 140,000. In 1875 Pagenstecher stated it as 300,000, and at present the number of insect species alone (including those yet undescribed) has been placed as high as 1,000,000. Methods of classification have necessarily grown in accuracy and complexity. Cuvier's type theory is still generally accepted, although now interpreted on a basis of interrelationship. Animals of the same type, family, genus or species are now looked upon not only as those having certain resemblances, but as those related to each other more or less closely by descent from a common ancestor. There has been considerable redistribution on this basis, especially in the higher and larger groups. In one system, widely accepted, the primary group is the "series," still higher than the type. The animal kingdom is divided into two of these—the *Protozoa* or one-celled animals and the *Metazoa* or many-celled. Some authorities subdivide the latter into *Acœlomata* (those having no body cavity) and *Cœlomata* (those possessing one). Other changes from earlier classifications are the substitution of several groups for the old one of worms (*Vermes*), the withdrawal of the bryozoans and brachiopods from the mollusks, the affiliation of sponges with the *Cœlenterata*, and the union with the vertebrates of the tunicates, and perhaps of other groups.

The sciences that have grown out of zoölogy are treated in separate articles. Such are MORPHOLOGY, now handled with a view to discovering the relationships and origins of animal groups; HISTOLOGY, the science of animal tissues; PHYSIOLOGY, which has not attained such progress in the study of the lower animals as in that of man; and EMBRYOLOGY, which has attained capital importance since the time of Darwin, owing to the belief that the development of the embryo reflects and throws light upon that of the race. The so-called "biogenetic law," as stated by Haeckel, asserts that the embryology of a group is a recapitulation of the history of its descent, and that this history may therefore be ascertained and studied by investigation of growth changes in the individual, especially before birth. So many modifications of this law have been brought to light, however, that it is not now dwelt upon so exclusively as formerly. Of late attention has been fixed on the cell and its contents, especially with a view to explaining the facts of heredity, so important to the science. Experimental methods have also been introduced, as by Loeb, in the United States, and the egg, or young embryo, is exposed to changed or abnormal conditions, the effects being noted and discussed. Loeb's fertilization of the sea urchin's eggs by chemical means is one of the best known of these modern experimental investigations.

These and other studies have been carried on in so-called "zoölogical stations" where marine or fresh-water animals are studied under natural conditions. The oldest is that established at Naples in 1872, and supported chiefly by the German Govt. The Univ. of Vienna has one at Trieste, the French Govt. one at Banyuls and one at Marseilles, and the Russians one at Villefranche. There are stations in Great Britain at Plymouth, Liverpool, and at St. Andrews, near Edinburgh; in Heligoland, at Sebastopol, and others in Norway and Sweden. Japan has one at Musaki. In the U. S. are the laboratory of Alexander Agassiz at Newport, the stations at Wood's Hole, Mass., and Cold Spring Harbor, Long Island, and that of Johns Hopkins Univ., whose location changes from year to year.

Besides these divisions of zoölogy, which have developed so strongly on the experimental side, there are also branches which deal with the relations between organisms and their surroundings. Since 1860 what is called zoölogical geography has been entirely remodelel, the distribution of animals being now interpreted in the light of evolutionary doctrines. The isolation of certain species on islands or island groups, the interposition of obstacles to migration, such as mountain chains or rivers, have had important bearings on their racial history. Here, too, belongs the discussion of the influence of more intimate environment, including that of protective coloration and other mimicry. The study of variation has recently also received attention, the most sensational discovery in it being that of the so-called "mutations," or sudden leaps, announced by Hugo De Vries from his study of plants, but believed by those who accept his theories to apply equally in zoölogy.

Zoroaster (zō-rō-ăs'tėr), the prophet of ancient Iran, whose teachings are preserved in the Avesta. The era at which he flourished has been open to discussion. Persian tradition claims the sixth century B.C., although the writers of antiquity vary between 1000 B.C. and 6000 B.C. in giving his date. There is good authority for believing that the district of Atropatene in W. Iran was his native place, but the scene of his preaching and teaching was Bactria in E. Iran. King Vishtaspa of Bactria was his religious patron, but the consensus of scholarly opinion is rather against identifying this ruler with Hystaspes, the father of Darius, notwithstanding the identity of the names.

Regarding the life of Zoroaster, there is no doubt that he was an historical personage. The tradition, moreover, is probably authentic that he began his ministry at the age of thirty, that he was forty-two when he converted King Vishtaspa, and that when seventy-seven he was slain, apparently in a storming of Balkh by the Turanians. He is commonly regarded as a Magian, a reformer of the old Iranian faith, and as the founder of a new creed. Dualism was one of its characteristic tenets, a belief in angels and archangels and in demons and fiends was recognized; the doctrine of a bodily resurrection was taught; the practice of agriculture and husbandry enjoined; and the care of useful animals, as well as keeping pure the fire, water, and earth, was inculcated. The power of Zoroastrianism as the national religion of ancient Persia was first broken by the invasion of Alexander, and although restored under the Sassanidæ, it was overthrown by the rise of Mohammedanism. To-day the faith is professed by about 90,000 Parsees.

Zouaves (zô-ăvz'). According to Ruffino, a body of Zouaves, or Zuaghi, tribesmen distinguished for bravery and skill, was in the service of the Sublime Porte in 1574. Prior to the French occupation of Algeria these Kabyle tribesmen were employed as mercenaries by the Barbary states. The French, after the conquest of Algiers, found themselves with a limited force in the midst of a hostile population. Gen. Clausel thereupon (1830) organized two battalions of Zouaves, designed at first to consist of natives only, but officers and some of the privates were later selected from French volunteers. The foreigners were then organized into a foreign legion, and the Zouaves remaining consisted almost entirely of young Parisians and natives from the vicinity of Algiers. They were at once put into active service, and distinguished themselves by their bravery and dash.

Difficulty having been experienced in keeping of the mixed command, the natives were eventually organized into a separate corps known as Turcos, and the Zouaves became almost entirely French. Their organization was modified, and service with them came to be regarded as the best school for ambitious officers of the French army. During the Crimean War the services of the Zouaves were conspicuous, and many innovations in drill tactics may be traced to them. The Zouaves served with distinction in the campaign in Mexico, and in the war of 1870–71. Their present organization consists of four regiments, each of four battalions of four companies. There are also in the French army four corresponding regiments of Turcos. In Algeria there are also *cadres* for ten battalions of Zouaves.

The Pontifical or Papal Zouaves were a body of volunteers, principally from the noble families of France, organized in 1860 for the defense of the temporal power of the pope. They fought with bravery in several actions, but were unpopular with the Italians, being regarded as foreign intruders. In 1870 they embarked for France, and returning to Tours were under Baron Charette as colonel recruited up to two battalions. Joining the army of Orleans, they fought with distinction at Orleans and Patay. They assisted the army of Versailles in suppressing the Commune. Their organization was dissolved after the entry of the army of Versailles into Paris.

During the Civil War in the U. S. several regiments of Zouaves were organized, who wore uniforms similar to that of the French Zouaves; some of them served with marked distinction.

Zuccaro (dzŏk'kä-rō), **Taddeo,** 1529–66, and **Federigo,** abt. 1542–1609; two brothers, Italian painters; Federigo was born at Sant' Angelo in Vado, Urbino, and was a pupil of Taddeo. He finished painting the frescoes in the Church of the Trinità del Monte in Rome begun by his brother, and then was called to Florence to finish the cupola in Santa Maria del Fiore begun by Vasari. In Rome the dome of the Paolina chapel, begun by Michelangelo, was confided to him; but having avenged himself on some favorites of Pope Gregory XIII, who had insulted him, he had to fly from Rome. He traveled for a time, and received commissions to paint portraits of Queen Elizabeth and Mary, Queen of Scots, also the "Adoration of the Magi." He was again called to Rome by the pope, who forgave his escapade and wished him to finish the work begun there. Philip II then invited him to Madrid, where his work was not liked, and what he did was effaced; but he was handsomely compensated. Returning to Rome, was elected president of St. Luke's Academy. Built himself a palace on the Pincio, which he adorned with frescoes. After this returned to Spain, but with no better success than the first time. Was also an architect and sculptor, and a writer in prose and verse.

Zuider Zee (zoi'dĕr zā). See ZUYDER ZEE.

Zu'luland, the country of the Zulus; bordering on the Indian Ocean, and formerly extending from Natal nearly to the Portuguese possessions in SE. Africa, and inland to the mountain barrier of the Transvaal Colony. As a result of the fierce war (1879) between the Zulus and British, and of the territorial ambitions of the Boers, the country was wrested from native control. Cetewayo was the last king of the independent native dynasty. He was crowned in 1873, and his word was law from the Tugela River to Delagoa Bay. His army of 40,000 men was a standing menace to the neighboring territories. The war of 1879 resulted in his dethronement, and though the British decided to restore him, his power and spirit were broken. He died at Ekowe, 1884. All that the British have retained, about two thirds of the country, is a protectorate of Natal. Most of the country is a productive table-land with a climate not injurious to Europeans. Area of British Zululand, 10,461 sq. m. Pop. (1906) abt. 94,370 whites and 1,057,537 Indians, Asiatics, and natives.

Zu'lus, a warlike Kaffir tribe of the Bantu family, occupying a territory in S. Africa to the NE. of Natal, of which colony it became a province in 1887. The Zulus are noted for a higher intelligence, courage, and morality than other native Africans, and their formidable army at first more than held its own against the British, notably at Isandula, where a body of British troops was annihilated; but the Zulus were finally defeated at the general battle of Ulundi in 1879.

Zuñian (zô'nyĭ-ăn) **In'dians,** a family of American Indians of W. central New Mexico; named by Fray Marcos de Niza "the people of Cibola or Civola." At the time of the Spanish explorations in the sixteenth century the Zuñian Indians were divided into seven tribal communities, occupying as many pueblos. This gave rise to the rumor of the "Seven Cities of Cibola," and, combined with the preeminence of the Zuñis in other ways, made them early the most widely known and respected of all the tribes of the arid region. They were regarded as the leaders in the arts, in government, and especially in magic—as the "Fathers of the Pueblos."

The Zuñis are intellectual and grave, yet witty. They are intensely mythic-minded, and hence poetic and religious to an extreme degree. Although peace-loving and unusually self-restrained, they are extremely courageous when defending their rights. They are perhaps the most polite of N. American aborigines.

Between 1542 and 1672 four of their towns were abandoned, and at the outbreak of the great Pueblo rebellion of 1680–92 they left their three remaining towns to seek refuge on their Gibraltar, Taaiyalane, where they lived in their sevenfold citadel until after the Peace of the Vargas.

At the beginning of the eighteenth century they seem to have occupied only Halorea, the midmost of their towns. Later they built seven other towns called the "Peach" or "So noli" villages. After joining in the war with Mexico, and later in that against the Navajos, they continued to tend their sheep and cattle and till their cornfields and irrigated patches of wheat, indifferent toward the outside world, as had for centuries been their wont.

At the time of the Pueblo conquest by Coronado, in 1540, the seven tribes of Zuñi numbered about 4,000. According to Vetancourt, the tribe numbered 2,500 in 1680. In the eighteenth century the Zuñis had been reduced to about 2,000, while in 1890 they numbered 1,613. They are not rapidly decreasing.

Zurich (tsü'rĭch), capital of the canton of Zurich, Switzerland; 43 m. NW. of Glarus; on the Limmat where it issues from the Lake of Zurich. It is well built, though somewhat old-fashioned. It has a university, a public library, a botanical garden, several museums of natural history, and a federal polytechnic school to which pupils from all Europe gather. Its manufactures comprise silk, cotton, leather, ribbons, lace, etc., and are extensive. Pop. (1908) 186,999.

Zurich, Lake of, lake of Switzerland; 23 m. long and 2½ m. broad; bounded by the cantons of Zurich, Schwytz, and St. Gall, and celebrated for the beauty of its scenery.

Zuyder Zee (zoi'dĕr zā), a gulf of the North Sea, 80 m. long and 40 m. in greatest breadth. Several islands lie across its mouth, and the principal communication with the North Sea is between the Helder and the island of Texel. It receives the waters of the Yssel and of the Amstel, both delta branches of the Rhine; at the entrance of the latter the city of Amsterdam is situated. In prehistoric times the Zuyder Zee was larger than at present, but in the eighth century much of it was dry and under cultivation. The great storm of 860, followed by those of 1134 and 1164, caused it to be again inundated. It is shallow, and the difficulty of navigating the S. part caused the construction of the North Sea Canal and of the Holland Canal as approaches to Amsterdam.

Zwingli (tsvĭng'lē), **Ulrich** or **Huldereich,** 1484–1531; German reformer and patriot; b. Wildhaus, Switzerland; studied at Wesen, Vienna, 1499–1501, and Basel, 1502–6; was carried away with the enthusiasm for classical learning, and got an insight into the corruptions of the Church; was ordained priest, and elected pastor of Glarus, 1506. He studied the Greek New Testament carefully; preached against the mercenary service of his countrymen; in 1516 accepted a call to St. Mary's at Einsiedeln, and began to attack superstitious practices, but with the consent of his superiors; he even received for a while, as one of the most popular preachers, a pension from the papal nuncio in Switzerland which aided him in his studies and secured his political influence. In December, 1518, he was called to the cathedral at Zurich, where he labored till his death. He preached "Christ from the fountains" and "inserted the pure Christ into the hearts"; broke loose gradually from Romanism; introduced the Reformation in Zurich, 1524, after some public disputations with the champions of the old system; attended the conference at Berne, 1528, which resulted in the abolition of the mass. He was invited to a personal conference with Luther and Melanchthon at Marburg, 1529, to adjust the only serious doctrinal difference between them on the Eucharistic Presence. He also entered into bold political combinations with Philip of Hesse for the triumph of the Protestant cause in Germany, and addressed the Emperor of Germany and the King of France with a confession of his faith. At the outbreak of the war between the Roman Catholic and Protestant cantons he accompanied the Zurich regiment as chaplain, and was pierced by a lance at Kappel while stooping to comfort a dying soldier.

Zwingli was a bold reformer, an able scholar, an eloquent preacher, a patriotic republican, and far-sighted statesman. He lacked the genius and depth of Luther and Calvin, the learning of Melanchthon and Œcolampadius, but he was their equal in honesty of purpose, integrity of character, heroic courage, and devotion to the cause of Reformation, and surpassed them in liberality. His prominent intellectual trait was clear, strong common sense.

Zyg'ospore. See DIATOMS.

INDEXES

ANALYTICAL INDEX

The Analytical Index, as will be seen at a glance, is designed to make the material of the Cyclopedia more available. Many of the articles include discussions of relatively minor topics, not important enough for separate articles in a work on the plan of the Cyclopedia. Such subjects are indexed below, in each case with a reference to the article in which the topic is treated, and the volume and page to be referred to. Many synonyms, also, are indexed.

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SYNTHETICAL INDEX

In this Index the articles are grouped under appropriate subject-headings, which cover the entire field of the CYCLOPEDIA. Those desiring to study any department of knowledge in a systematic manner, or to refer to and compare a series of related articles, will find it easy to do so with the aid of the Index.

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